DEPARTMENT
ENGINEERING & DESIGN

PREPARED BY Project Engineers

KUMAIL N. AL-FASHKHI

DATE: 15 / 08 / 2024

APPROVED BY Group Leader

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)

Whing of

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

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FINAL SCOPE OF WORK AND TECHNICAL SPECIFICATIONS FOR

PURCHASE CONTRACT FOR TRANSFORMERS AND REACTORS PTS - 24CM1046

ENGINEERING & DESIGN DIVISION-EOA
ENGINEERING & DESIGN DEPARTMENT
ENGINEERING & PROJECTS DEVELOPMENT SECTOR
ENGINEERING & ASSET MANAGEMENT BL
NATIONAL GRID SAUDI ARABIA

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				APPENDIX NO.	APPENDIX TITLE			REN	//ARK	
				APPENDIX-1	DRAWING CONTROL SHEE	T & DRAWII	NGS			
				APPENDIX-2	MATERIAL DATA SCHEDUL	ES				
				APPENDIX-3	PROTECTION REQUIREME	NTS				
				APPENDIX-4	TRAINING REQUIREMENTS	3				
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SECTION 1 INTRODUCTION

1.1 GENERAL INTRODUCTION

This Scope of Work and Technical Specifications and associated PROJECT Conceptual Drawings, which are Attachment-I to Schedule "B" of this CONTRACT, describe the specific scope of work that the MANUFACTURER is required to carry out on Lump Sum Turnkey (LSTK) basis, until the successful commissioning, completion and final acceptance of WORK, by National Grid SA (hereafter referred to as COMPANY or NG).

1.2 CONTRACT DESCRIPTION

This CONTRACT is intended to supply COMPANY with the following power transformers and reactors which will be used by SUBSTATION CONTRACTORS for construction of substations, in different areas of Kingdom of Saudi Arabia.

- 50/67 MVA, 110/13.8 kV, YNyn0+d1
- 50/67 MVA, 115/13.8 kV, Dyn1
- 50/67 MVA, 132/13.8 kV, Dyn1
- 50/67 MVA, 132/13.8 kV, YNyn0+d1
- 80/100 MVA, 132/33 kV, YNyn0+d1
- 40 MVAR, 132kV Bus Shunt Reactor

The relevant main online diagrams for typical power transformers having various parameters are shown on drawings listed in the drawing control sheet no. CT-926693.

1.3 CONTRACT SUMMARY

The MANUFACTURER shall design, engineer, manufacture, factory test, supply and supervise installation, testing & commissioning of power transformers & reactors equipment complete with all accessories along with all associated work and services in a satisfactorily manner as specified in this scope of work and technical specifications.

1.4 DEFINITION OF TERMS

Terms, abbreviations and/or expressions frequently used in this document shall have the following meaning:

TERMS/ ABBREVIATION/ EXPRESSIONS	MEANING
COMPANY	National Grid SA (Subsidiary of Saudi Electricity Company)
SEC	Saudi Electricity Company
PROJECT	Construction and/or reinforcement of substation(s) to be carried out by SUBSTATION CONTRACTOR
SUBSTATION	Contractor responsible for the installation of power
CONTRACTOR (or	transformers equipment and construction of new substations
CONTRACTOR)	in different areas of Kingdom of Saudi Arabia

DRAWING CONTROL SHEET

CT-926693

FINAL SOW/TS FOR PURCHASE CONTRACT FOR TRANSFORMERS AND REACTORS

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				JOB SITE/	WORK	Substation SITE	110				
				SITE							
				ASTM		American Societ	y for Testin	g and N	1aterials		
				Asym.		Asymmetrical					
z				AVC		Automatic Volta	ge Control				
IPT10				ВСР		Bay Control Pane					
DESCRIPTION				BCU		Bay Control Unit					
				COMPANY	7	Personnel Autho	rized by CO	MPAN	/		
				REPRESEI	NTATIVE		•				
				СТ		Current Transfor	mer				
				CTR		Current Transfor	mer Ratio				
				DCS		Drawing Control	Sheet				
				GT		Grid Transforme	r				
				GIS		Gas Insulated Sv	vitchgear				
				IEC		International Ele	ctrotechnic	al Comi	mission		
				IED		Intelligent Electro	onic Device				
Ö.		2		IEEE		Institute of Elect	rical and Ele	ectronic	s Engineers		
Ż	Ľ	<u> </u>		IFC		Issued for Const	ruction				
	REV	ISIONS		kA		Kiloampere					
	DEPAR	RTMENT	-	kV		Kilovolt					
ENGI	NEERI	NG & DE	SIGN	kVA		Kilo Volt Ampere					
	DDED	ARED B	<u>, </u>	LCC		Local Control Ca	binet				
F		Engine		LCP		Local Control Pa	nel				
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	APPRO	OVED BY	,	MVA		Mega Volt Ampe	re				
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				SOW/TS	Scope of WORK	and Tachni	oal Spo	oifications		
				sq.mm	Square millimete					
				SGT	Super Grid Trans		e iiiiii c), 111111Z		
				TCS	COMPANY Tran		onstruc	tion Standard		
				TES	COMPANY Tran					
				TFR or DFR	Transient Fault					
_				TMSS	COMPANY Tran					
DESCRIPTION				TSD	COMPANY Tran					
ESCRI				T/L, T/Line	Transmission Li		.a.raara	<u>Diamingo</u>		
٥				U/G or UG	Underground					
				WP	Work Package					
				X/R	The ratio of read	tance to res	sistance	9		
				XFMR	Transformer					
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		VF AL∓ASH /08/2		2	2.	EQUIPMENT Preliminary Design	MANUFACTURER shall submit complete set(s) of		ion drav	virigo.	the	ANY to re EQUIPM inary de	
KHA DA	CERTIF DD-EOA	Leader L-HANG 08 / 20 FIED BY	DUN D24 ON			Package(s)	EQUIPMENT preliminary design package(s) (Hard and soft copy) after the PURCHASE CONTRACT kick-off meeting.				COMP repres attend design meetin	ANY entatives prelimi re	
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TO CONS ORDE	BE OTRUCT RING L CER	MENT IS USED TON OF MATE TIFIED	FOR R FOR RIALS				review ineeting .						
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DESCRIPTION								MANUFACTURER'S representative(s) ir each field of specification to attend the presentation meeting to finalize the EQUIPMENT preliminary design package(s). MANUFACTURER to prepare minutes of the meeting.	f o o o o o o o o o o o o o o o o o o o					
_						3.	EQUIPMENT Final Detail	MANUFACTURER shall submi				the	ANY to re EQUIPM	ENT
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	DEPAFINEERII PREP	ING &	DES					package(s) (Hard and soft copy) afte finalizing the preliminary design.	r			1 -	entatives final d	to letail view
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	ALIL I.							MANUFACTURER'S representative(s) ir each field o				meetir	ng.	
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ENGI	DEPAR' NEERIN PREPA Project I	ARED BY	SIGN <u>/</u> ers		4.	PROJECT(S) Base Design Package(s)	MANUFACTURER'S representative(s) in each field of specification to attend the presentation meeting to finalize EQUIPMENT design of related PROJECT(S). MANUFACTURER to concur on the minutes of the meeting on points related to purchase contract equipment.	submit PROJE design (Hard a after PROJE meeting SUBST CONTR represe e each specific	ACTOR CT(S) packa and soft CT(S) k g. ATION ACTOR cation field cation fCT(S) ATION ACTOR cation formation formation formation formation formation formation formation formation formation ation formation formation ation formation formation ation formation formation ation formation ation formation ation formation ation formation ation ation formation ation ation formation ation ation ation formation ation atio	the base ges(s) copy) the ick-off S (s) in of to the eeting inalize base	the base package COMP arrang	ge(s). ANY e ECT(S) re ng. ANY r on es of	esign to the
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			MANUFACTURER shall submit factor	·			inspec EQUIP	tion MENT.	of
DESCRIPTION			inspection schedul of EQUIPMENT, after receiving the relater "Purchase Order" for COMPANY review.	er d					shall a
			MANUFACTURER shall arrang traveling				copy o techni manua		IENT data
			requirements of COMPANY personner for witnessing factor inspection & testing of EQUIPMENT.	el y					
ON PREVISIONS			MANUFACTURER shall contract wit	h					
DEPARTMENT ENGINEERING & DESIGN			COMPANY approve quality assuranc and quality control	е					
PREPARED BY Project Engineers KUMAIL N. AL-FASHKHI DATE: 15 / 08 / 2024			services CONTRACTOR(S) to provide quality assurance	0					
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DESCRIPTION								interaction between the COMPANY and QA/QC services CONTRACTOR(S) [Independent Inspection Agency(ies)].	I						
								MANUFACTURER shall hand over to COMPANY copy(ies) of EQUIPMENT test record book and copy(ies) of technical data manual.) [
ON	-	,	+	ဧ		7.	EQUIPMENT "Final As-	MANUFACTURER shall submit						ANY to re	
	REVIS	SION	ıs				Manufactured" Package(s)	complete set(s) of all drawings and					As-Ma packa	nufacture de(s).	ed"
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	<u>PREPA</u> Project I							as "Final As- Manufactured" after incorporating all the	-						
	LH UMAIL N. ATE: 15							comments raised in "As-Manufactured" packages(s) and							
	APPRO Group					8.		during FAT.		IDOT	ATION		OOMB	A N I V /	
	ALIL I. A	AL+H	- ANO			0.	EQUIPMENT "As- Built" Drawings	MANUFACTURER shall coordinate with the COMPANY for drawings marked with SITE changes.	CO ma l cha for	NTR ark a anges	ATION ACTOR all the s in "I Constru	SITE ssued iction"	marke MANU order t	ver the second distribution of the second se	gs to ER in "As-
E	CERTIF EDD-EOA MANAG	A DIV	/ISIO	ON O				MANUFACTURER shall incorporate all	hai CO	_	er the		suffici	ent detail et an accu	ls to urate
АМ	EEN H.	AL-H	ULA	IMI				the SITE changes marked in "Noted By"					record COMP		for
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							drawings to the COMPANY.						
DESCRIPTION					9.	EQUIPMENT Design Package(s) Documents Format	MANUFACTURER shall provide all the equipment and interface drawings to COMPANY at every stage in Microstation and PDF formats, as applicable.	coordin COMPA necessa to be in	ACTOR ate wit NY fo ary dra corpora ACTOR' drawin stage,	th the r the wings ated in s gs at	from MANU every Micros PDF	FACTURE stage station formats,	3
					10.	Power Transformer/Rea ctor Notification & Purchase	MANUFACTURER to acknowledge the receiving of "Power Transformer/Reactor				"Powe Transf	ANY to is ormer/Re otification	act
NO.	REVIS	N SIONS	က			Orders	Notification" & "Purchase Order".				EQUIP specifi	MENT	for
ENGII P KU DA	Project I	ARED BY Enginee AL-FASH / 08 / 2	Y errs				MANUFACTURER shall not commence manufacturing activities of the ordered EQUIPMENT until the related Purchase Order is issued by the COMPANY.				COMP related Order.	ANY to is	
KHA	Group ALIL I. A TE: 15 /	Q— LHANG	OUN		11.	EQUIPMENT Progress Report	MANUFACTURER to submit monthly progress reports in COMPANY approved	coording follow	ACTOR ate up	and with	MANU	nate up FACTURE	
E&	CERTIF DD-EOA MANAC EEN H. A	DIVISI GER (A)	ION) AIMI				formats (Hard and soft copy) to the responsible COMPANY representative. MANUFACTURER to	EQUIPM progres SUBSTA CONTRA	MENT s. ATION ACTOR	for to nation		nate TATION RACTOR	ent and with
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					#	Work	MANUFACTURER			STATIC TRACT		C	OMPANY	
DESCRIPTION							period of the PROJECT(S) as found necessary by COMPANY.	T C p o E	CONTRA prepare	SUBSTA ACTOR the m meeting IENT	to inutes	period	MENT ss during of ECT(S).	the the
					12.	Release for Shipment, Delivery & Handover	MANUFACTURER is responsible to arrange insurance, ship and deliver EQUIPMENT and unload the EQUIPMENT on	Control Contro	SUBSTA CONTRA espons construct QUIPM oundati SUBSTA	ACTOR ible ction IENT	is for of at SITE.	COMP "Relea Shipm certific	ent"	ssue for
NO.	REVIS	6 SIONS	ю				foundation at SUBSTATION SITE in Saudi Arabia.	s C	SUBST <i>A</i> CONTRA	ACTOR	is			
ENGII P	PREPA PREPA PROJECT E	RED BY Enginee	SIGN Y ers				ALL cost of custom clearance of EQUIPMENT and custom duties and fee to be borne by MANUFACTURER.	d y l lo l m		а				
KHA	APPROV Group I LIL I. AI	Leader L-HANG	DUN				MANUFACTURER shall not ship the EQUIPMENT until receiving a release for shipment certificate issued by COMPANY.	 - -						
E&I	CERTIF DD-EOA MANAG	DIVISION (A)	ON				MANUFACTURER shall coordinate with COMPANY for the delivery schedule.							
THIS TO CONS	DOCUM BE U TRUCTI RING CERT	IENT IS USED ION OF MATE	S NOT FOR R FOR RIALS				MANUFACTURER shall submit to COMPANY a document of EQUIPMENT	1						
DRAWI	ING COL	NTPOL	CUEET	<u> </u>		COWITO FOR BURGI	· ·	DI A	INT NO.	INDEX	DOCUM	ENT NO.	PAGE NO.	REV.
	T-92					SOW/TS FOR PURCE SFORMERS AND REAC	IASE CONTRACT FOR CTORS SAUDI ARABIA		2150	A	P	rs- 11046	14 OF 60	01

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					#	Work	MANUFACTURER		BSTATION NTRACT		С	OMPANY	
DESCRIPTION							handover to SUBSTATION CONTRACTOR. This document shall indicate PROJECT(S) information, purchase order reference, shipment certificate, time and date of handover and the status of EQUIPMENT packing with acknowledgement of SUBSTATION CONTRACTOR.						
NO.	1	2	в		13.	Receipt Inspection	MANUFACTURER shall conduct receipt	SUBST	ATION RACTOR	shall	COMP condu		to ceipt
ENGII	DEPAR NEERIN PREPA	TMENT NG & DE	SIGN Y			mopeonon	inspection of EQUIPMENT after delivery at PROJECT(S) SITE and during opening of EQUIPMENT packing	f conduct r inspect t EQUIPI delivery f PROJE	et r tion MENT /	receipt of after at SITE	inspec EQUIP deliver	etion MENT y ECT(S) SIT	of after at
		AL FASH / 08 / 2					MANUFACTURER shall submit a receipt	of packin	EQUIP	_	witnes remov		ntlin
КНА	Group LIL I. A	Leader	OUN				inspection report with SUBSTATION CONTRACTOR concurrence to the COMPANY.	SUBST CONTF remove the im	RACTOR e/disma pact re resence	ntle corder	record acknow receiving MANU evaluation	er wledge ng FACTURE	and ER's for
E&I	MANAG	FIED BY A DIVISI GER (A)	ION)				MANUFACTURER to receive the record of the impact recorder from the SUBSTATION	represe f forward t to MANU	entative d the re FACTUR analysis	ecords the ER for	ппрас	r records.	
DA.	TE: 15 /	/ 08 / 20	024				CONTRACTOR, analyze the same and			المطم			
TO CONS ORDE	BE TRUCT RING CER	MENT IS USED TON OF MATE	FOR R FOR RIALS				inform the COMPANY of his evaluation and findings.	repack EQUIPI		the under			
DRAW	ING CO	NTROL	SHEET	FIN	IAL	SOW/TS FOR PURCH	ASE CONTRACT FOR	PLANT NO.	INDEX	DOCUM	IENT NO.	PAGE NO.	REV.
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					#	Work	MANUFACTURER		BSTATIO ITRACT		C	OMPANY	
DESCRIPTION								the fouready commits SUBST CONTR prompt the CO	ACTOR ly repo	shall ort to			
								shipme transpo damag	ortation	and			
					14.	EQUIPMENT Replenish / Replacement	See Section 3.19		ction 3.1	9	See Se	ection 3.19	9
ENGIN P KU DA KHA DAT	DEPAR' NEERIN PREPA WALLIL MAIL N. APPRO' Group I CERTIF	IG & DE RRED BY Enginee AL-FASH / 08 / 2 L-HAN(/ 08 / 2 IL-HAN(/ 08 / 2	Y Yers HIKHI 10024		15.	Installation, Testing and Commissioning	MANUFACTURER shall provide complete SITE installation, testing and commissioning procedures of the EQUIPMENT supplied to SUBSTATION CONTRACTOR before shipment. MANUFACTURER shall conduct inspection and supervision of testing activities of EQUIPMENT at al phases and quality audit at appropriate stages of the PROJECT(S) construction/installat ion.	work of shall is SUBST. CONTR direct MANUF supervisintimat MANUF advance supervisithe requirements with the requirements available PROJE	ommiss f EQUIP DE BOTT ATION ACTOR FACTUR SION ACTOR E and FACTUR E ion pla Juired d Sor ility	MENT ne by under ER shall notify ER in the an and ate of	comm shall b	E testing issioning be done u ANY witno	nder
THIS TO CONS	DOCUM BE U TRUCTI RING CER'	V 08 / 20 MENT IS USED HON OF MATE	S NOT FOR R FOR				Cost of MANUFACTURER supervisor(s) including air ticket to). 					
							PROJECT SITE(S)	'	-	.			<u> </u>
	T-92					SOW/TS FOR PURCH FORMERS AND REA	HASE CONTRACT FOR CTORS SAUDI ARABIA	NG2150	A	P	TS- 11046	16 OF 60	01

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						#	Work	MANUFACTURER			STATIC TRACT		C	OMPANY	
O. DESCRIPTION		2		3				and back, VISA insurance, food accommodation, local transportation requirements from hotel to job site and back shall be arranged and borne by MANUFACTURER Shall obligate to SUBSTATION CONTRACTOR plan for supervision.	n n d e e e e e e e e e e e e e e e e e						
Ö	REVIS	SIONS		e				duration o	of						
ENGI	DEPAR NEERIN PREPA	NG & D	ESI BY					and commissioning as per COMPAN's specifications and requirements is:	g Y						
KL	JMAIL N. ATE: 15	₩ ALFAS	SHKH	HI				- 25 working man days for one (1 transformer/Rea ctor EQUIPMENT)						
KH <i>I</i>	APPRO Group ALIL I. A TE: 15 /	Leade AL-HAN / 08 / 2	NOU 2024 <u>Y</u>	4		16.	Operational Spare Parts	MANUFACTURER shall provide and deliver operational spare parts to designated COMPANY	d al					dı HASE	ssue for pare uring
1	MANA	AL-HU	LAII			17.	Special Tools/Test Equipment	MANUFACTURER shall provide and deliver special tools/test equipmen	al						any
THIS TO CONS	DOCUM BE STRUCT RING L CER D	MENT USED TON C	IS N F OR F	NOT FOR FOR ALS				to COMPAN' designated warehouse(s), a required b COMPANY.	Y s				PURCI CONTI	HASE	
DRAW	ING CO	NTRO	L Sł	HEET			SOW/TS FOR PURCH	ASE CONTRACT FOR	P	LANT NO.	INDEX	DOCUM	IENT NO.	PAGE NO.	REV.
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						#	Work	MANUFACTURER			STATIC TRACT		C	OMPANY	
DESCRIPTION								In case, the MANUFACTURER requires to perform any special test/check, MANUFACTURER shall provide/use his own tools/test equipment.	n il						
NO.	F REVIS	2 SAOIS		3				MANUFACTURER shall be responsible for the insurance of the new special tools/test equipment(s) ordered by COMPANY up to final destination.	f il d						
ENGI	DEPAR NEERIN PREPA Project I	TMEN NG & D	IT DESI			18.	Training	MANUFACTURER shall submit factory training program for COMPANY review and approval.	r				an factory require PURCI	ements du HASE	for ining
DA	APPRO Group LLIL I. A	OVED E Leade	BY er NOU	IN .				MANUFACTURER shall arrange factory training complete with all required instructional materials and travelling requirements.	e d				CONTI	RACT.	
E&	CERTIF DD-EOA MANA(Why EEN H. A	A DIVIS GER (A	SION A) JLAII	мі				SITE demonstration during installation and testing shall be conducted by MANUFACTURER supervisor(s).	n e						
TO CONS ORDE	DOCUM BE TRUCT RING CER	USED ION (MAT	F OR F ERI	FOR FOR ALS		19.	Warranty Certificate	MANUFACTURER shall provide COMPANY, a	e a				the E0	MPANY fo QUIPMEN fective w	T to
DRAW	ING CO	NTRO	L SI	HEET	FIN	ΙΔΙ	SOW/TS FOR PURC	HASE CONTRACT FOR	P	LANT NO.	INDEX	DOCUM	IENT NO.	PAGE NO.	REV.
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					#	Work	MANUFACTURER		STATIC TRACT		C	OMPANY	
							warranty certificat for the EQUIPMENT.	е		(COMP	arranty pe ANY e for warr	to
DESCRIPTION						This section MANUFACTURE	MER EQUIPMENT/WORK describes interface R and SUBSTATION C ugh the COMPANY REP	jobs/activiti ONTRACTO	es be R. The				
					#	Work / Equipment / Item	TRANSFORM MANUFACTUR		SU	BSTATIO	N CON	ITRACTO	R
KI	DEPAR INEERII	PARED t Engine	IT DESIGN BY eers		1.	Power Transformers	Design, engineer, magactory test, supply transformers wire appurtenances and a Provide supervision installation, testing commissioning of transformers with all works and services successful commissioning in all acceptance of the COMPANY.	of power th all ccessories. of the g and the power associated until the oning and	com trans appu and servi com acce COM	all asso ces unt missionir	ng es and ociated il the	of pov with accessor I work a success	all ries and sful nal
DA E8	ALIL I. ATE: 15	AL-HAI IFIED E AGER (A	NOUN 2024 EY SION		2.	132/115/110kV and 13.8/33kV cables (as applicable)	Provide suitable met glands with shrouds fo cable entries at the end Provide flexible links cables and bushings it box.	r sealing all losures. s between	test 132/ cable HV appli inclu	and 115/110les in po bushings	kV and bwer to cable nd LV cable and	requi	ion BkV ers (as kes oort
THIS TO CONS	DOCUM BE STRUCT ERING L CER	MENT USED TION (IS NO FO OR FO ERIAL	R R S	3.	Outdoor bushing connectors	Provide terminal hard accessories suitable f kcmil ACSR overhead per phase on 132, bushing of power tr (Air).	for 1 x 795 and commission 1 x 795 kcmil ACSR overhead conductor per phase, with termination hard			mil per ard (for ing		
DRAW	ING CO	ONTRO	L SHE			=	CHASE CONTRACT FOR	PLANT NO.	INDEX	DOCUMEN	NT NO.	PAGE NO.	REV.
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					#	Work / Equipment / Item	TRANSFORM MANUFACTUR		SU	BSTATION COM	NTRACTO	R
TION										ing (SF6/Cable ing of power t	,	HV
DESCRIPTION					4.	LV Auxiliary power and control cables (External to the power transformers and their local control cabinet)	Provide all LV Auxiliary control cables to b between Power T accessories and loc cabinet/OLTC MDU.	e installed ransformer	test Auxil cable Powe cabin room	ide, install, splice and commis iary power a ses to be installer Transformer net and substantials.	sion all and cont led betwe local cont ation cont	LV trol een trol trol
NO.	ı	2	8	!	5.	Surge Arresters	Provide (96, 108 or applicable) outdoor, st metal-oxide Surge Arre	ation class,		III onto bracke formers, tern commissio	ninate, t	
	REVIS DEPAR						Provide mounting braces surge arresters adjaces outdoor air bushings.			ters.		
ки	PREPA Project I WA JMAIL N. ATE: 15	Enginee AL-FASH	ers		6.	Transformer HV & LV Neutral Grounding	Provide HV & LV neutral bars/leads for transfor connections, as applications.	mer ground able. LV neutral	test grou trans grou	nding connections of the control of	nission ons of pove substat NGR;	all wer ion (as
KHÁ	APPRO Group ALIL I. A	Leader L-HAN	DUN				bushings, support insisting suitable brackets on the tank for grounding wire from transformer tall clause 12.1 of TES-P-1	ransformer s insulation nk as per	mate	cable) includin	g all requi	red
E&	CERTIF DD-EOA MANAC	DIVISI GER (A)	ON		7.	Transformer Tank Grounding	Provide the provision transformer tank groun clause 4.19 of 53-TMSS	ıding as per	com at t	ide, terminate mission groun wo point of sformer tank a of TES-P-119.1	ding cab the pov s per clau	les ver
THIS TO CONS ORDE	DOCUM BE UTRUCT	V 08 / 20 MENT IS USED HON OF MATE	S NOT FOR R FOR	:	8.	Neutral Grounding Resistors (NGR) (if applicable)	Cable Tray/Support on Transformer shall be p the cable connecting th LVN Bushing.	provided for	com neut (NGF	mission and te	erminate t g resisto ne pov	ors wer
DATE												
	ING CO		SHEET			SOW/TS FOR PUR SFORMERS AND RE	CHASE CONTRACT FOR ACTORS	PLANT NO.	INDEX	DOCUMENT NO. PTS-	PAGE NO. 20 OF	REV.
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				#	Work / Equipment / Item	TRANSFORM MANUFACTUF		SU	BSTATION CON	NTRACTO	R
									ecting cable s mm2.	hall be 10	Сх
DESCRIPTION				9.	Grounding Transformer (if applicable)	Provide the provision fo transformer in the LV C	-	and inter type		-	ase ag)
				10	Online Gas Analyzer	Online Gas Analyzer is under this Contract. Power Transformers design to have the provision to the same use.	However, shall be e required				
ő.	-	2	е	11	. Work Coordination		ORK and e activities		dinate all \ truction interfa		and ies
ENGI	DEPAR	NG & DE	SIGN Y			with all CONTRACTORS/Agence	other cies and essary for on of all	with MAN CON COM succ		ot encies a cessary etion of	her and for
	ÆH UMAIL N. ATE: 15					CTOR EQUIPMENT/WOR		\CE		•	·NT
	APPRO Group	Leader			MANUFACTURE	ER and SUBSTATION Cough the COMPANY REP	ONTRACTO	R. The			
	ALIĽ I. A	/ 08 / 2	024	#	Work / Equipment / Item	TRANSFORM MANUFACTUF		SU	BSTATION CON	NTRACTO	R
AMI DA THIS TO CONS	DD-EO/	AL-HUL / 08 / 2 MENT I: USED TION OI MATE	AIMI 024 S NOT FOR R FOR RIALS	1.	SHUNT REACTOR	Design, engineer, magactory test, supply reactor with all appurted accessories. Provide of the installation, to commissioning of reactor with all associand services until the commissioning are	of shunt nances and supervision esting and the shunt ated works successful	com react and asso until com acce	missioning tors with all ap accessories ciated work a the	of shi purtenand and and servious success and fi	all ces sful nal
DATE	:U										
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				#	Work / Equipment / Item	TRANSFORM MANUFACTUR		SU	BSTATION CON	NTRACTO	R
						acceptance of the w COMPANY.	ork by the				
DESCRIPTION				2.	132/115/110kV cables (as applicable)	Provide suitable met glands with shrouds fo cable entries at the end	r sealing all	test 132/ reac (as a supp	ide, install, splic and 115/110kV cal tors bushings/ applicable) inc oort structures nding materials	commiss bles in sho cable boo luding ca and requi	ion unt xes ible
				3.	Outdoor bushing connectors	Provide terminal hard accessories suitable f kcmil ACSR overhead per phase on 132, bushing of shunt reactor	or 1 x 795 conductors /115/110kV	and ACSI phas ware	ide, install, ter commission 1 R overhead co se, with termi ss and acces 115/110kV	x 795 kc enductor nation ha	mil per ard (for
NO.		SIONS	3					(SF6 betw bush	/Cable/Air)) for	r connect 2/115/110 ble/Air) a	ion OkV and
F KU DA	PREPA Project I What JMAIL N. ATE: 15	ARED BY Enginee AL-FASH / 08 / 2	<u>(</u> rrs ікні 024	4.	LV Auxiliary power and control cables (External to the shunt reactors and their local control cabinet)	Provide all LV Auxiliary control cables to between Shunt accessories and locabinet/OLTC MDU.	e installed reactor	test Auxil cable Shur cabil room	ide, install, splice and commis liary power a ses to be install at reactor longer and substantials.	sion all and cont led betwe cal cont ation cont	LV trol een trol
		4— AL-HANG / 08 / 20		5.	Surge Arresters	Provide (96, 108 or applicable) outdoor, st metal-oxide Surge Arre	ation class,	reac	all onto bracke tors, terminate mission surge a	e, test <i>a</i>	and
E&	DD-EOA	FIED BY A DIVISI GER (A)	ON			Provide mounting brace surge arresters adjace outdoor air bushings.					
THIS TO	TE: 15 / DOCUM BE	AL-HUL / 08 / 20 MENT IS USED TON OF	NOT FOR	6.	Shunt Reactor Tank Grounding	· · · · · · · · · · · · · · · · · · ·		ding cab hunt reac	oles etor		
ORDE	RING L CER	MATE TIFIED	RIALS								
DRAW	ING CO	NTROL	SHEET		. SOW/TS FOR PUR SFORMERS AND RE	CHASE CONTRACT FOR	PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.
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				#	Work / Equipment / Item	TRANSFORM MANUFACTUR		SU	BSTATION COM	NTRACTO	R
DESCRIPTION				7.	Online Gas Analyzer	Online Gas Analyzer is a under this Contract. Shunt reactors shall be have the required provesame for future use.	However, e design to				
				8.	Work Coordination	construction interface with all CONTRACTORS/Agence	essary for on of all	cons with MAN CON COM succ	truction interfa	oce activit ot encies a cessary etion of	her and for all
Ö	1	2	ъ			END OF C	PECTION 2				
	REVIS					END OF S	ECTION 2				
ENGI	NEERIN PREPA										
F	Project E										
	JEAN JMAIL N.	/F/ AL FASH / 08 / 2	ікні 024								
	APPRO Group										
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E&	CERTIF DD-EOA MANAC	DIVISI	ON								
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	EEN H. <i>F</i>										
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DEPARTMENT
ENGINEERING & DESIGN

PREPARED BY Project Engineers

KUMAIL N. AL-FASHKHI DATE: 15 / 08 / 2024

APPROVED BY Group Leader

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED

SECTION 3 BASIC REQUIREMENTS AND GUIDELINES

3.1 GENERAL CONDITIONS

- A. All components and accessories required for the completion and successful operation of the WORK covered under the scope of this PURCHASE CONTRACT, either specified in detail or not, shall be supplied by the MANUFACTURER as necessary.
- B. The engineering design and specification of equipment/materials supplied under this PURCHASE CONTRACT shall be in accordance with this scope of work, technical specifications and COMPANY standards.
- C. The drawings enclosed with this scope of work and technical specifications are conceptual and for the information of MANUFACTURER only. The MANUFACTURER should read these drawings in conjunction with this scope of work and technical specifications. The successful MANUFACTURER shall develop detailed design drawings for construction purposes.
- D. The specifications of EQUIPMENT specified herein are to be considered as the minimum requirements, and the MANUFACTURER shall carry out his own EQUIPMENT basic and detailed design necessary for his proposed specifications.
- E. All documents, drawings, data and instruction books to be submitted by the MANUFACTURER shall be written in English language and Metric unit system.
- F. COMPANY'S acceptance of the MANUFACTURER'S design does not relieve him of any part of his obligations to meet all the requirements of this PURCHASE CONTRACT nor the responsibility for the correctness of the design drawings of EQUIPMENT to the related PROJECT(S).
- G. MANUFACTURER shall have a local office in Saudi Arabia as full authorized representative for managing, coordinating activities, close communication, handling and supervising this PURCHASE CONTRACT.
- H. MANUFACTURER shall provide complete address of his office in Saudi Arabia and full contact information. All correspondence and notices will be made at the provided MANUFACTURER office address in Saudi Arabia. Any change in address or key personnel, COMPANY shall be notified promptly.
- I. MANUFACTURER shall provide full details for his Saudi Bank Account in order to facilitate payments for the purchase orders.

3.2 PURCHASE CONTRACT KICK-OFF MEETING

A Kick-Off meeting will be held in COMPANY Headquarters shortly after the award of this PURCHASE CONTRACT. This meeting will cover EQUIPMENT design stage, scope

DRAWING CONTROL SHEET

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الشركة الوطنية لنقل الكهرباء **National Grid SA** of work, schedule and will give MANUFACTURER an opportunity to discuss all matters related to carrying out his responsibilities and interface points. 3.3 **EQUIPMENT DESIGN PHASE GENERAL** Α. DESCRIPTION The EQUIPMENT design stage for this PURCHASE CONTRACT is an 8-10 week period from the kick-off meeting. The purpose of the EQUIPMENT design stage is to completely define the EQUIPMENT in enough details to ensure the COMPANY that all requirements are being met. Information developed during the EQUIPMENT design shall be used as a quide throughout the PROJECT(S) and shall be considered binding on both parties, unless operational difficulties or design flaws observed during detailed design review are noted and mandate change. MANUFACTURER is responsible to provide any design/data required in the scope of work and technical specifications of PROJECT(S). PRELIMINARY DESIGN PACKAGE(S) The MANUFACTURER shall submit, for each EQUIPMENT type, two (2) sets of ġ EQUIPMENT preliminary design documents (Hard and soft copy) within four (4) week REVISIONS period after the PURCHASE CONTRACT kick-off meeting. DEPARTMENT The EQUIPMENT design submittal shall be submitted fully complete. Partial submittals **ENGINEERING & DESIGN** of package(s) are unacceptable and will be rejected. Additional drawings, if provided, will PREPARED BY not be reviewed during the EQUIPMENT preliminary design stage. **Project Engineers** FINAL DETAIL DESIGN PACKAGE(S) KNP KUMAIL N. AL-FASHKHI DATE: 15 / 08 / 2024 **APPROVED BY**

The MANUFACTURER shall submit, for each EQUIPMENT type, two (2) sets of EQUIPMENT detail design documents (Hard and soft copy) within four (4) week period after finalizing the EQUIPMENT preliminary design.

The EQUIPMENT detail design package(s) shall be submitted fully complete. Partial submittals of package(s) are unacceptable and will be rejected.

MANUFACTURER DRAWINGS

Group Leader 144

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION

MANAGER (A)

AMEEN H. AL-HULAIMI DATE: 15 / 08 / 2024

THIS DOCUMENT IS NOT

ORDERING MATERIALS UNTIL CERTIFIED AND

USED CONSTRUCTION OR FOR

TO BE

DATED

- 1. All MANUFACTURER drawings shall be subject to review and approval by the COMPANY at various stages (Bid/EQUIPMENT preliminary design/EQUIPMENT final detail design/PROJECT(S) base design/PROJECT(S) final detail design/As-Manufactured/Final As-Manufactured/As-Built).
- 2. The MANUFACTURER shall submit typical samples for drawings in Flash Memory/internet cloud link along with EQUIPMENT design package(s) for COMPANY review and check of drawings' conformance to the requirements of the COMPANY engineering drawing preparation standards (SEEDS-II).

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- 3. The drawings shall be assigned with drawing numbers and indexed as per COMPANY requirements. A block of drawing numbers shall be provided by the COMPANY for all new drawings/documents at various stages (Bid/EQUIPMENT preliminary design/EQUIPMENT final detail design/PROJECT(S) preliminary design/PROJECT(S) final detail design/As-Manufactured/Final As-Manufactured/As-Built).
- 4. MANUFACTURER drawings are design drawings, data schedules, specification sheets, installation, operating instructions and any other data required for EQUIPMENT installation. Such information is an integral part of the purchase order and shall be specified by the MANUFACTURER.

Note: All MANUFACTURER drawings shall be consistent with main drawings in all respects and the MANUFACTURER drawings shall clearly indicate all inter references with main drawings and all other MANUFACTURER drawings, as applicable.

3.4 EQUIPMENT PRELIMINARY REVIEW

MANUFACTURER shall present the EQUIPMENT preliminary design package(s) for technical review along with the drawing control sheet. MANUFACTURER'S representative(s) in each field of specification shall attend the presentation meeting. During this meeting, the COMPANY'S comments on the EQUIPMENT design package(s) will be reviewed and discussed in detail to finalize the EQUIPMENT design.

Minutes of the meeting shall be prepared by the MANUFACTURER and concurred by the KNF KUMAIL N. AL-FASHKHI COMPANY representative(s). DATE: 15 / 08 / 2024 3.5 **EQUIPMENT FINAL DETAIL DESIGN REVIEW APPROVED BY Group Leader** MANUFACTURER shall present the EQUIPMENT final design package(s) for technical 144 review along with the drawing control sheet. MANUFACTURER'S representative(s) in KHALIL I. AL-HANOUN each field of specification shall attend the presentation meeting. During this meeting, DATE: 15 / 08 / 2024 the COMPANY'S comments on the EQUIPMENT final design package(s) will be reviewed and discussed in detail to finalize the EQUIPMENT detail design. **CERTIFIED BY** E&DD-EOA DIVISION MANAGER (A) Minutes of the meeting shall be prepared by the MANUFACTURER and concurred by the COMPANY representative(s). AMEEN H. AL-HULAIMI **EQUIPMENT FINAL DETAIL DESIGN CERTIFICATION** 3.6 DATE: 15 / 08 / 2024 THIS DOCUMENT IS NOT MANUFACTURER shall submit point wise compliance statement to COMPANY'S USED FOR TO BE CONSTRUCTION OR FOR comments and obtain approval for all final detail design package(s) after ORDERING MATERIALS incorporating COMPANY comments. UNTIL CERTIFIED AND DATED INDFX PAGE NO. RFV. DRAWING CONTROL SHEET PLANT NO. DOCUMENT NO. FINAL SOW/TS FOR PURCHASE CONTRACT FOR TRANSFORMERS AND REACTORS 26 PTS-**OF** CT-926693 Α 01 NG2150 24CM1046 **SAUDI ARABIA** 60

REVISIONS

DEPARTMENT
ENGINEERING & DESIGN

PREPARED BY
Project Engineers

الشركة الوطنية لنقل الكهرباء

National Grid SA

3.7 PROJECT(S) BASE DESIGN PHASE

The MANUFACTURER shall submit three (3) sets of the PROJECT(S) base design documents (Hard and soft copy) within four (4) weeks period after the PROJECT(S) kick-off meeting.

3.8 PROJECT(S) BASE DESIGN REVIEW

MANUFACTURER'S representative(s) in each field of specification shall attend the presentation meeting. During this meeting, the COMPANY'S comments on the base design package(s) will be reviewed and discussed in detail to finalize the base design for the PROJECT(S) and EQUIPMENT design of related PROJECT(S).

Minutes of the meeting will be prepared by the SUBSTATION CONTRACTOR and concurred by COMPANY and MANUFACTURER representative(s).

3.9 AS-MANUFACTURED DRAWINGS

MANUFACTURER shall furnish two (2) complete set of all drawings (Hard and soft copy) to COMPANY stamped as "As-Manufactured", two (2) weeks before EQUIPMENT factory acceptance test. Drawings shall have the P.O. number and Power Transformer ID (as per clause 4.02) on each sheet for the designated projects.

3.10 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

A. Quality Management

MANUFACTURER shall implement an effective quality management which addresses all direct and indirect activities related to this PURCHASE CONTRACT to ensure that all contractual conditions are met. Quality planning, quality control, quality assurance and quality improvement shall be part of MANUFACTURER's quality management. To effectively manage the EQUIPMENT quality, MANUFACTURER shall develop a clearly defined EQUIPMENT Quality Plan/Quality Program. The EQUIPMENT Quality Plan/Quality Program shall be implemented through all stages during manufacturing process starting from procurement, reception of raw material. manufacturing/fabrication and until EQUIPMENT delivery. In addition, MANUFACTURER is also required to develop and implement quality control/Inspection and testing plan for EQUIPMENT as per Section 3.10.C.

B. **EQUIPMENT Quality Plan/Quality Program**

 The EQUIPMENT Quality Plan/Quality Program shall set out the specific quality procedures and practices, resources, and all activities (in sequence) relevant to this PURCHASE CONTRACT. The EQUIPMENT Quality Plan/Quality Program shall

INDEX PAGE NO. RFV. PLANT NO. DOCUMENT NO. DRAWING CONTROL SHEET FINAL SOW/TS FOR PURCHASE CONTRACT FOR TRANSFORMERS AND REACTORS 27 PTS-CT-926693 Α **OF** 01 NG2150 24CM1046 **SAUDI ARABIA**

DEPARTMENT
ENGINEERING & DESIGN

PREPARED BY Project Engineers

KHT KUMAIL N. AL-FASHKHI

DATE: 15 / 08 / 2024

APPROVED BY Group Leader

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND

DATED

					stor		QA/QC activities during de lelivery, installation, testir NT.	• .		· ·	-	
				2.			IIPMENT Quality Plan/0 Y as part of the EQUIPMI	•	-			
DESCRIPTION				3.	The EQUIPMENT Quality Plan/Quality Program shall clearly define and addr the following:							ess
					a.	<u>Pro</u>	curement Control					
						prio Pro insp	NUFACTURER's QA/QC entered to encure to encurement control shall in pection and evaluation of NUFACTURER against the	sure confor nclude source objective e	mance ce evalu vidence	to specified rule ation and sele of quality furr	equireme ction, sou	nts. urce
					b.	Qua	ality Audit					
NO.	REVIS	SIONS	в			MA	NUFACTURER shall cor	duct its ov	vn inte	rnal quality su	ırveillance	e at
	DEPAR	TMENT					ropriate stages (e.g. denmissioning stage) of the			-		
ENGI		NG & DE				the effectiveness of the EQUIPMENT Quality Plan/Quality Program. Each element of the EQUIPMENT Quality Plan/Quality Program shall be assessed						
F		ARED BY Enginee				at le	east three (3) times duri	ng PURCHA	SE CO	NTRACT. The	schedule	and
KL	Æ IMAIL N.	₩ AL-FASH	IKHI			freq exis	juency should be adjust st:	ed if one o	r more	of the followin	ng conditi	ons
	APPRO	/ 08 / 20 VED BY Leader				i.	Result of previous surve frequently.	eillance indi	cates a	need to perforr	n them m	ıore
	ALIL I. A	G— LHANC				ii. Significant changes are made in the EQUIPMENT Quality Plan/Quality Program.						
	CERTIF	/ 08 / 20				iii. Safety, performance or reliability of an item is questionable due to non- conformance.						ion-
E&.		DIVISION (A)	DN			iv.	Verification of corrective	e action imp	lement	ation.		
AME	EN H.	AL-HUL	AIMI			Pers	onnel conducting the qu	ality surveill	ance sł	nall be independ	dent of th	ose
DA	TE: 15 /	/ 08 / 20)24				ng direct responsibility fo ssessed.	r the specifi	c activit	ies or areas be	ing evalua	ated
TO CONS ORDE	BE TRUCT RING CER	MENT IS USED TON OR MATEI TIFIED	FOR FOR RIALS		C.		-Conformance Control					
DRAW	ING CO	NTROL	SHEET	FINAL SOW/	TS FO	R PUF	RCHASE CONTRACT FOR	PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.
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MANUFACTURER'S QA/QC engineer/inspector shall re-inspect repaired and reworked non-conforming items. MANUFACTURER shall not use any repaired item or product unless approved by the COMPANY. Under this clause, the following definitions apply: i. Repair - Action taken on a non-conforming product so that it will fulfill the intended usage requirements although it may not conform to the original specified requirements (ISO 9000-2015). MANUFACTURER'S QA/QC engineers/inspectors shall have the freedom to issue NCRs, verify implementation of corrective actions and prevent use of non-conforming items until the deficiency has been satisfactorily resolved. MANUFACTURER'S QA/QC engineers/inspectors shall have the freedom to issue NCRs, verify implementation of corrective actions and prevent use of non-conforming items until the deficiency has been satisfactorily resolved. MANUFACTURER shall develop, document and implement a system for determining the root cause of non-conformities and identifying the required corrective actions. New procedures or changes to existing procedures resulting from identification of the root cause and potential root cause of non-conformances shall be deucemented and implemented. Follow-up action shall be taken to verify effective implementation of corrective action. MANUFACTURER shall develop and maintain a system for preparation, maintenance, protection and preservation of quality records. Documents such as inspection reports, field inspection checklist, factory test reports, laboratory test reports, witnessed test reports, inspection logbooks, equipment calibration records/certificates, drawings and specifications, approved submittals and non-conformance reports are part of these records. TRANSFORMERS AND REACTORS CT-926693 TRANSFORMERS AND REACTORS SAUDI ARABIA AG2150 A PTS- 29 29 24CM1046 60 TEST 24CM1046	to specified requirement are controlled in accordance with doc procedures to prevent unintended use. MANUFACTURER shall document, segregate, evaluate and dispose non-conforming its services after proper notification of concerned personnel w MANUFACTURER'S organization.										shall iden g items	ited tify, and	
i. Repair - Action taken on a non-conforming product so that it will fulfill the intended usage requirements although it may not conform to the original specified requirements (ISO 9000:2015). ii. Rework - Action taken on a non-conforming product so that it will fulfill the specified requirement (ISO 9000:2015). MANUFACTURER'S QA/QC engineers/inspectors shall have the freedom to issue NCRs, verify implementation of corrective actions and prevent use of non-conforming items until the deficiency has been satisfactorily resolved. MANUFACTURER shall develop, document and implement a system for determining the root cause of non-conformities and identifying the required corrective actions. New procedures or changes to existing procedures resulting from identification of the root cause and potential root cause of non-conformances shall be documented and implemented. Follow-up action shall be taken to verify effective implementation of corrective action. MANUFACTURER shall develop and maintain a system for preparation, maintenance, protection and preservation of quality records. Documents such as inspection reports, field inspection checklist, factory test reports, laboratory test reports, witnessed test reports, inspection logbooks, equipment calibration records/certificates, drawings and specifications, approved submittals and non-conformance reports are part of these records. THIS DOCUMENT IS NOT SOME CONTROL SHEET FINAL SOW/TS FOR PURCHASE CONTRACT FOR PLANT NO. INDEX DOCUMENT NO. PAGE NO. REV. TRANSFORMERS AND REACTORS TRANSFORMERS AND REACTORS III. Rework - Action taken on a non-conforming product so that it will fulfill the intended usage requirement (ISO 9000:2015). III. Rework - Action taken on a non-conforming product so that it will fulfill the intended usage requirement (ISO 9000:2015). III. Rework - Action taken on a non-conforming product so that it will fulfill the specified requirement (ISO 9000:2015). III. Rework - Action taken on a non-conforming senting the deficiency has been satisfactoril	DESCRIPTION					reworked non-conforming items. MANUFACTURER shall not use any							
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DATE: 15 / 08 / 2024 APPROVED BY Group Leader WHALL I. AL-HANOUN DATE: 15 / 08 / 2024 CERTIFIED BY EADD-EOA DIVISION MANAGER (A) WHALL I. AL-HAULAIMI DATE: 15 / 08 / 2024 CERTIFIED BY EADD-EOA DIVISION MANAGER (A) WHATE LEAD FOR DIVISION MANAGER (A) WHATE LEAD FOR DIVISION MANAGER (B) AMEEN H. AL-HULAIMI DATE: 15 / 08 / 2024 THIS DOCUMENT IS NOT TO BE USED FOR DORSONERHOLTON OR FOR CONDERNING MATERIALS UNTIL CERTIFIED AND DATE: DRAWING CONTROL SHEET TRANSFORMERS AND REACTORS CT-926693 determining the root cause of non-conformities and identifying the required corrective actions. New procedures or changes to existing procedures resulting from identification of the root cause and potential root cause of non-conformance reports are ported to non-conformance reports, inspection of quality re					d.	Corrective Action	<u>1</u>						
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MANUFACTURER shall ensure that items and services which do not conform

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DESCRIPTION					All measuring and testing of quality of construction MANUFACTURER shall deve control program indicating of those who are responsible for shall ensure that only properties that only properties are used presented to the COMPANY related jobs.	shall be elop and im equipment of er control of erly identifi d. Equipme	e con plemen calibrati the EQU ied and nt calib	trolled and t a documente on schedule ar JIPMENT. MAN calibrated me ration certifica	maintair d calibrat d identify UFACTUF easuring a tes shall	ned. tion ring RER and be	
				g.	Document Control						
MANUFACTURER shall develop and maintain a documented corprogram for the review, approval, revision and distribution of documents the activities affecting quality. Responsible personnel for revision, issual and approval of documents shall be identified. Control shall ensure the pertinent and current issues of appropriate documents are available locations where they are essential and obsolete or superseded documents are promptly removed. MANUFACTURER shall list all the documents have to be controlled and shall include EQUIPMENT Quality Plan/Quipments. Program, quality control plan/inspection and test plan, drawing the program of the controlled and shall include the plan of the controlled and test plan, drawing the program of the controlled and shall include the plan of the controlled and test plan of the controlled and test plan of the program of the									ocuments ion, issua nsure tha available d docume tuments t Plan/Qua	for nce t all e at ents that	
\vdash		TMENT			calculations, correspondenc checklist, etc.	-		•		-	
ENGI	NEERIN	IG & DE	SIGN		·						
F		ARED BY		h.	Material/Equipment Handlin	<u>g, Storage, I</u>	<u>dentific</u>	ation and Cont	<u>rol</u>		
	## JMAIL N. ATE: 15	₩ ALFASH / 08 / 2	ікні 024		MANUFACTURER shall verify requirements and are prop preserved and stored.			•			
		VED BY Leader		i.	Control of interface and int services CONTRACTOR [Inde				and QA	/QC	
КНА	ALIL I. A	HANG	DUN	j.	Any other applicable QA/QC activity(ies) for the EQUIPMENT.						
DA	TE: 15 /	/ 08 / 20	024	4. <u>Design Control</u>							
C	MANAG	FIED BY A DIVISI GER (A)	ON	 All design input and output shall be reviewed prior to release to the nex stage. In addition to design review, design verification shall be conducted to ensure that the design stage output meets the design stage inpu requirements. 						d to	
DA	TE: 15 /	/ 08 / 20	024	b.	MANUFACTURER shall en	sure that	all des	ign computat	ions, des	sign	
TO CONS ORDE	BE TRUCT RING CER	MENT IS USED TON OF MATE TIFIED	FOR FOR RIALS		drawings and other design documents are properly controlled and checked prior to submission to the COMPANY. Design documents shall be signed by the person(s) who prepared and checked them. COMPANY reserves the						
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						right to return design doc responsible person(s).	uments wit	hout th	ne proper sign	ature of	the
				5.	<u>Field</u>	I Testing/Inspection and Cons	truction/Ins	stallatio	n Control		
DESCRIPTION					instr	NUFACTURER shall establish ructions to ensure that the ere controlled manner.			•		
DESC					at a	NUFACTURER shall conduct in the struction of the structio	=		-		
				C. <u>Q</u> ս	ıality Co	ntrol Plan/Inspection and Tes	st Plan				
				The MANUFACTURER shall submit to the COMPANY the quality of plan/inspection and test plan for EQUIPMENT covered under purchase ord							
The quality activities including but not necessarily limited to, inspection testing, for the EQUIPMENT shall be planned and documented in the form									-		
	REVIS	SIONS	<u> </u>		quality control plan/inspection and test plan. The quality control plan/inspection and test plan test plan shall be submitted to the COMPANY together with the EQUIPMENT						
	DEPAR [*]	TMENT				test plan snall be submitted to lity Plan/Quality Program.	the COMP	ANY to	gether with the	EQUIPME	IN I
ENGI		IG & DE		2.	The	essential features of the requi	red quality c	ontrol n	lan/inspection	and test r	olan
P		Enginee				as follows:	ou quanty o	σ	nan, mopeonen	aa. 1001 p	,,,,,,
KU	ÆA MAIL N.	AL-FASH	IKHI		a.	It is specifically identified to	a particular	materia	al/equipment.		
	APPRO	/ 08 / 2 VED BY Leader			b.	It has provision for revisions number.	to be made	and is a	ssigned a uniq	ue docum	ent
	14	4			C.	c. It lists all the inspection and testing activities sequentially.					
		L-HAN(' 08 / 20			d.	d. It states the location at which the activity is to be carried out.					
E&	DD- <mark>EOA</mark>	FIED BY DIVISI GER (A)	ON		e.	It identifies the applicable s acceptance criteria for the ir	-	•		wed and	the
AME	EN H. A	AL-HUL	AIMI		f.	It identifies the extent of inspectation extent of check.	ection, sam	pling fr	equency and sa	ample size	e, or
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				3.	The quality control plan/inspect dates of testing and inspection at		-		ie schedu	ıled
DESCRIPTION				4.	The MANUFACTURER shall as Personnel for witnessing factory of EQUIPMENT, as per the requirements shall submit a schedule for factoring for CO	manufactur ements of s ctory inspec	ing prod ection (tion of	cess, inspection 3.27. The MAN	n and test UFACTUF	ting RER
DESC				5.	Inspection and test plan is to be a stage.	pproved dur	ing EQL	JIPMENT prelin	ninary des	sign
				D. <u>Othe</u>	r Suppliers					
					UFACTURER shall ensure that practed to other manufacturers/sup			_		ub-
					ity Assurance and Quality Contro	Services C	<u>ontract</u>	or [Independen	t Inspect	<u>ion</u>
O	-	7	3	<u>Ager</u>	<u>ісу</u>]					
	REVIS	SIONS		1.	MANUFACTURER shall contract v Quality Control Services CONTI			•		
		TMENT			Assurance monitoring of all q EQUIPMENT.					-
		ARED BY Enginee		2.	MANUFACTURER shall instruct	the contrac	ted Qua	ality Assurance	and Qua	ality
	Æ	VF7			Control Services CONTRACTO	` '	-	-		
		AL-FASH / 08 / 2			REPRESENTATIVE, by express r quality surveillance reports, inspe the inspection. Soft copy of these	ction and tes singed repo	st report rts in CI	s within seven () shall also be f	(7) days a urnished a	fter and
		VED BY Leader			submitted for COMPANY record shall be reviewed, signed and star	nped by the	approve	ed inspector fro	-	
КН	ALIL I. A	HANG	DUN		Assurance and Quality Control Services CONTRACTOR.					
DA	TE: 15 /	/ 08 / 20)24	3.	MANUFACTURER'S Quality A CONTRACTOR shall not re-assig Control/Quality Assurance monite	n or sublet	portion	Quality Contro of their contra		
E8	DD-EOA	FIED BY DIVISI GER (A)	ON	_	·			6.1		
(Why	mg 2		4.	MANUFACTURER shall provide the to the Quality Assurance and Qua			-		ued
		AL+HUL/ / 08 / 20		5.	MANUFACTURER shall instruct		•		•	
THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED			FOR FOR RIALS		Services CONTRACTOR to ver conformance against the PROJE and each clause of the applical (TMSS) and report all deviations	CT(S) scope ble COMPAN	of work	and technical erial Standard	specificat Specificat	tion tion
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					ifications. The report of the C NTRACTOR shall include the fo	-	rance a	nd Quality Con	itrol Servi	ces			
				a.	PROJECT title, CONTRACT r	number.							
				b.	Complete description of the	Complete description of the inspected material/equipment.							
DESCRIPTION				C.	Report number and date.	and date.							
DES				d.	Place and date of inspection	, scope of ir	nspectio	on.					
				e.	Documents used during insp	ection.							
				f.	f. MANUFACTURER and plant location where the EQUIPMENT was manufactured.								
Ċ				g. Detailed description of the inspection and testing activities and their results, deviations to specification, MANUFACTURER'S explanation to the deviations, visual inspection result, packing and marking inspection result, conclusion and copy of the outline drawing of the inspected									
Ŏ.	REVIS	SIONS	в		material/equipment. Witnes	sed tests an		_	•				
		TMENT			identified in the inspection re								
ENGI		NG & DE		h.	Name and signature of the i	nspector(s).							
к	Project I ## JMAIL N.	Enginee AL-FASH / 08 / 2	irs IKHI	Ass Qua	NUFACTURER shall furnish courance and Quality Control Se urance and Quality Control Se ore surveillance:	rvices CON	TRACTO	OR(s) contracte	ed to perfo	orm			
		VED BY Leader		a.	Purchase order placed to the	e manufactı	urer/sup	oplier.					
l KILL	164	AL-HANG	N. IN.	b.	Relevant section of PROJEC	T(S) scope	of work	and technical	specificat	ion.			
		/ 08 / 20		C.	Applicable COMPANY developed standard and specification.								
E&	DD- <mark>EO</mark>	FIED BY A DIVISI GER (A)	ON	d.	MANUFACTURER'S technic design drawings.	cal specific	ations	and COMPAN	IY appro	ved			
AMI	EN H.	mg d	AIMI	e.	COMPANY'S approval of maissued by the COMPANY.	aterial/equip	oment a	and applicable	clarificati	ons			
		/ 08 / 20		f.	COMPANY approved test p	rogram, ma	nufactu	ıring quality co	ntrol plar	n or			
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DRAW	ING CO	NTROL	SHEET	=	R PURCHASE CONTRACT FOR	PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.			
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				7.	MANUFACTURER shall send to the COMPANY, copy(ies) of all technical correspondence exchanged between MANUFACTURER and "Quality Assurance and Quality Control Services CONTRACTOR".
DESCRIPTION				8.	MANUFACTURER shall obtain approval from COMPANY before allowing any personnel of the Quality Assurance and Quality Control Services CONTRACTOR to perform Quality Assurance and Quality Control monitoring activities related to EQUIPMENT manufacturing. MANUFACTURER shall propose the names of the inspectors from the latest COMPANY Approval List. The specific material/equipment to be inspected, MANUFACTURER and location of manufacturing plant shall be identified for each proposed inspector of the Quality Assurance and Quality Control Services CONTRACTOR.
				9.	COMPANY has the right to hire third party to monitor the process of manufacturing, the MANUFACTURER shall provide all required facilities in the factory to accommodate the third party in order to facilitate his task.
				F. <u>COM</u>	PANY's Quality Assessment (Audit) Right
NO.		6 SIONS	8	1.	COMPANY reserves the right to conduct scheduled and/or unscheduled quality assessment of MANUFACTURER's Quality System and EQUIPMENT Quality Plan implementation. The results of such assessments (audits) shall be confidential
	DEPAR NEERIN	TMENT IG & DES	SIGN		between MANUFACTURER and COMPANY.
F		ARED BY Engineer			MANUFACTURER shall provide all access and assistance in a timely manner to COMPANY personnel who will perform the quality assessment (audit).
	KUT KUMAIL N. AL-FASHKHI DATE: 15 / 08 / 2024			The MANUFACTURER shall implement corrective actions on all deficient areas discovered during the quality assessment (audit) within a mutually agreeable time frame. All costs (except cost of wages, transportation and lodging of COMPANY	
	APPRO Group	VED BY Leader			Quality Assessors) incurred during the quality assessment (audit) shall be borne by the MANUFACTURER.
		HANO		2.	COMPANY reserves the right to perform plant survey, quality assessment (audit),
DATE: 15 / 08 / 2024					and quality surveillance activities and to inspect material at the

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MANUFACTURER'S facility to verify compliance with the terms and conditions of the purchase order(s) and its related documents. COMPANY reserves the right to witness any and all tests specified and to perform such visual examination (inspection) at the MANUFACTURER'S facility. COMPANY reserves the right to require certificates and data from the MANUFACTURER on any pertinent aspect of the manufacturing process, including but not limited to, mill test reports, heat treatment certificates, welders and welding procedure qualification records, nondestructive examination records, test records and quality control manual that will form part of the non-material requirement that shall be shipped to COMPANY as a document package.

3.11 TEST RECORD BOOK

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The Quality Assurance and Quality Control Services Contractor shall send directly to the

MANUFACTURER shall send to the COMPANY a copy of "Test Record Book" for factory

COMPANY a copy of "Test Record Book" for factory test report of EQUIPMENT.

3.12 FINAL AS-MANUFACTURED DRAWINGS

test report of EQUIPMENT.

MANUFACTURER shall furnish two (2) complete set of all drawings (Hard and soft copy) to COMPANY, stamped as "Final As-Manufactured" within two (2) weeks after Factory Acceptance Testing (FAT) for the designated PROJECT.

The "Final As-Manufactured" Drawings shall incorporate all the comments raised during "Factory Acceptance Testing (FAT)" and in "As-Manufactured" drawings.

3.13 EQUIPMENT AS-BUILT DRAWINGS

MANUFACTURER shall coordinate with the COMPANY for final SITE marked drawings with SITE modifications. MANUFACTURER shall prepare "As-Built" drawings in sufficient details to present an accurate record for the COMPANY within two (2) weeks after the COMPANY has handover SITE marked drawings to the MANUFACTURER.

3.14 Power Transformer/Reactor Notification & PURCHASE ORDERS

EQUIPMENT will be requested through "Power Transformer/Reactor Notification" that will be initiated by COMPANY for specific PROJECT(S), for which terms and conditions stipulated in this PURCHASE CONTRACT shall apply.

The "Power Transformer/Reactor Notification" shall be considered accepted upon COMPANY receipt of the MANUFACTURER's acknowledgment. However, if no exceptions are recorded by MANUFACTURER within seven (7) days of the order receipt, total acceptance of the order is acknowledged by MANUFACTURER without reservation or exceptions, whether or not MANUFACTURER has signed and returned the acceptance copy.

MANUFACTURER shall not commence the activities of the manufacturing of the ordered EQUIPMENT until the related "Purchase Order" has been issued by COMPANY.

However, MANUFACTURER may proceed with procurement of basic components which are unlikely to change based on COMPANY comments on MANUFACTURER'S submittal.

3.15 PROGRESS REPORTING

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ENGINEERING & DESIGN

PREPARED BY Project Engineers

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DATE: 15 / 08 / 2024

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KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

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nonthly progress reports, in
o the responsible COMPANY

- A. The MANUFACTURER shall submit EQUIPMENT monthly progress reports, in COMPANY approved formats (hard and soft copy) to the responsible COMPANY representative. For this purpose, the total WORK shall be divided into:
 - 1. Engineering and Design.
 - 2. Procurement/Manufacture/Fabrication, inspection and delivery of EQUIPMENT.
 - 3. Supervision on EQUIPMENT installation.
 - 4. Supervision on EQUIPMENT testing and commissioning.
- B. The following information shall be included in the progress reports:
 - Percent of WORK completed as compared to the weighted schedule used to assess WORK progress.
 - 2. Problem areas which can have an adverse effect on the schedule.
 - 3. Supervisors and equipment availability against the schedule requirement.
- C. The MANUFACTURER shall carry out planning/scheduling by using MS PROJECT computer software or other COMPANY approved software. All schedules shall be submitted in CD-ROM.
- D. As found necessary by COMPANY, coordination meeting(s) for EQUIPMENT progress will be conducted between COMPANY, MANUFACTURER and SUBSTATION CONTRACTOR during the duration of the PROJECT(S) contract. The SUBSTATION CONTRACTOR will prepare the minutes of all meetings. The initial draft will be submitted by the SUBSTATION CONTRACTOR to the COMPANY representative and the MANUFACTURER representative for review and concurrence. The SUBSTATION CONTRACTOR will then incorporate the required corrections and submit to the COMPANY one (1) original and three (3) copies after they are duly signed by the authorized representatives of the MANUFACTURER and SUBSTATION CONTRACTOR. The COMPANY shall sign two (2) copies in acceptance and furnish one (1) to the MANUFACTURER and one (1) to the SUBSTATION CONTRACTOR and retain the original.

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3.16 PACKING

Packing and shipping shall be in accordance with 01-TMSS-01.

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3.17 RELEASE FOR SHIPMENT

- "Release for Shipment Certificate" is a certificate issued by the COMPANY to the MANUFACTURER to release the described EQUIPMENT for shipment after COMPANY approval of the EQUIPMENT factory test report.
- MANUFACTURER shall ensure that all material requiring inspection and/or quality surveillance at the MANUFACTURER'S facility are not shipped to the WORK SITE without a "Release for Shipment Certificate."
- 3. MANUFACTURER acknowledges that material shipped without approved "Release for Shipment Certificate" is subject to rejection and return at the MANUFACTURER'S expense.
- 4. MANUFACTURER shall ensure that all inspection and surveillance reports and any other requirements are satisfactorily completed before requesting the COMPANY to approve the "Release for Shipment Certificate."

3.18 EQUIPMENT DELIVERY

MANUFACTURER is responsible to arrange insurance, shipment, custom clearance, deliver and unloading the EQUIPMENT on the foundation at SUBSTATION SITE in Saudi Arabia. All cost at custom clearance, custom duties and fees of EQUIPMENT, to be borne by the MANUFACTURER.

The delivery schedule of EQUIPMENT to the SUBSTATION SITE will be (8-10) months from the date of "Purchase Order".

MANUFACTURER shall not ship the EQUIPMENT until "Release for Shipment Certificate" issued by COMPANY. This certificate will be considered as integral part of payment documents.

MANUFACTURER shall coordinate with COMPANY/SUBSTATION CONTRACTOR for the delivery schedule.

SUBSTATION CONTRACTOR will be responsible for construction of EQUIPMENT foundation at SUBSTATION SITE.

SUBSTATION CONTRACTOR will be responsible for storing all the loose materials/panels/relays in a safe place inside or near substation.

Due to reasons beyond COMPANY'S control, COMPANY can request MANUFACTURER to delay the shipment of EQUIPMENT by maximum three (3) months without any additional cost to COMPANY for shipment delay period and EQUIPMENT storage. In case, COMPANY requests to delay the shipment of EQUIPMENT more than three (3) months, a storage cost will be applicable to the COMPANY for extra delay days than the three (3) months.

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3.19 RECEIPT INSPECTION

MANUFACTURER, SUBSTATION CONTRACTOR and COMPANY shall conduct receipt inspection of EQUIPMENT after delivery at PROJECT(S) SITE and during opening of EQUIPMENT packing. CONTRACTOR will repack the equipment under the supervision of the MANUFACTURER in case the EQUIPMENT foundation is not ready as per the committed schedule date.

MANUFACTURER shall submit to COMPANY a document of EQUIPMENT Hand-Over to SUBSTATION CONTRACTOR. This document shall indicate PROJECT(S) information, purchase order reference, shipment certificate, time and date of handover and the status of EQUIPMENT packing with acknowledgement of SUBSTATION CONTRACTOR.

2. SUBSTATION CONTRACTOR will promptly report to the COMPANY for any shipment and transportation damage.

3.20 EQUIPMENT REPLENISH/REPLACEMENT

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TRANSFORMERS AND REACTORS

In case the EQUIPMENT or part of the EQUIPMENT is lost or damaged or failure during transit and/or erection/testing, the following action to taken:

Item	Event	Responsible	Action
1.	Damage During Shipment of the EQUIPMENT up to SUBSTATION SITE. OR Part of EQUIPMENT is Lost.	MANUFACTURER	 SUBSTATION CONTRACTOR will notify COMPANY of damage occurrences and attaching the verification report for documenting the case. MANUFACTURER shall replenish the same without affecting PROJECT Schedule at no extra cost to COMPANY. If delay in PROJECT schedule happen due to lost or damage, a delay penalty to be applicable.
2.	Damage During Installation	SUBSTATION CONTRACTOR;	 SUBSTATION CONTRACTOR will notify COMPANY of damage occurrences and attaching the verification report for documenting the case. SUBSTATION CONTRACTOR will coordinate directly with MANUFACTURER to replenish the

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Event	Responsible	Action
		same and Cost (to be paid by SUBSTATION CONTRACTOR) shall be mutually agreed upon. - MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule.
Failure of EQUIPMENT During TESTING & COMMISSIONING	MANUFACTURER	 SUBSTATION CONTRACTOR will notify COMPANY of failure occurrences and attaching the inspection report for documenting the case. MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule at no extra cost to COMPANY. If delay in PROJECT(S) schedule happen due to lost or damage, a delay penalty to be entitled by

COMPANY.

3.20 TECHNICAL DATA MANUALS

The MANUFACTURER shall provide two (2) copies of EQUIPMENT technical data manuals installed for PROJECT(S).

The manuals binders shall have COMPANY logo, binder number and PROJECT(S) title, and CONTRACT number on the front cover.

3.21 COMMISSIONING, OPERATION AND MAINTENANCE MANUALS

- The MANUFACTURER shall submit to the COMPANY commissioning, operation and maintenance manuals, along with pre-commissioning and procedures manuals, consisting of, as a minimum, the following documents:
 - 1. Detailed MANUFACTURER'S instruction manuals applicable to each equipment installed. These manuals shall contain all information (including any special design and/or construction or operation feature) which may be required by the COMPANY for safe operation and maintenance of the new facilities and shall describe fully erection, commissioning, operation and maintenance procedures including mechanical/electrical tolerances for maintenance/repair purposes (Hard and soft copy).
 - 2. MANUFACTURER'S instruction manuals applicable to each particular test apparatus (Hard and soft copy).

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- 3. Complete sets of exploded view drawings with comprehensive parts identification for each device to enable the COMPANY to catalogue and order.
- 4. Interconnection and schematic diagrams.
- 5. Setting and calibration procedures and instructions.
- 6. Gasket Layout drawing showing the Size, Material and Location of each Gasket/O-ring.
- The submission schedule for commissioning, operation and maintenance manuals as detailed in (A) above shall be as given below:
 - 1. Six (6) sets for preliminary review by COMPANY as to adequacy, completeness, and legibility at least eight (8) weeks before commencing commissioning tests.
 - 2. Four (4) complete sets of fully revised manuals original (original hard and soft copy and no photocopies) incorporating the COMPANY'S comments to the full satisfaction of the COMPANY before technical completion of the PROJECT(S).

3.22 SPECIAL TOOLS/TEST EQUIPMENT

MANUFACTURER shall provide and deliver to COMPANY designated warehouse new special tools/test equipment as ordered by COMPANY. However, general and SITE testing equipment for installation, testing and commissioning will be provided by SUBSTATION CONTRACTOR.

MANUFACTURER shall arrange insurance coverage of all special tools/test equipment up to the WORK SITE to the final destination.

All cost at custom clearance, custom duties and fees of special tools/test equipment to be borne by the MANUFACTURER.

These special tools shall be supplied by MANUFACTURER, only after confirmation by COMPANY through written order(s) during duration of PURCHASE CONTRACT.

Type/Model/Make of special tools indicated by the COMPANY/SUBSTATION CONTRACTOR is tentative only. Correct type/model/make against each item of shall be supplied, based on drawings approved by COMPANY.

MANUFACTURER shall provide/use his own tools/test equipment's that are required for testing and commissioning the equipment at SITE. MANUFACTURER shall be responsible for the insurance of his tools.

For More details, refer to **Appendix-6**.

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3.23 START-UP SPARE PARTS

MANUFACTURER shall deliver start-up spares along with EQUIPMENT complying with COMPANY specifications and standards. However, all components required for successful commissioning of the supplied EQUIPMENT due to failures/defects noticed shall be replaced by MANUFACTURER.

MANUFACTURER shall submit technical data sheet as per latest COMPANY format for start-up covered under this PURCHASE CONTRACT for COMPANY approval before procurement. These details shall also be accompanied by catalogue cuts and drawings and/or extracts from O&M Manuals indicting details of each spare part.

3.24 OPERATIONAL SPARE PARTS

MANUFACTURER shall provide and deliver to COMPANY designated warehouse(s) in Saudi Arabia operational spares complying with COMPANY specification as per schedule "C".

MANUFACTURER shall arrange insurance coverage of all operational spare parts up to the final destination.

All cost at custom clearance, custom duties and fees of operational spare parts to be borne by the MANUFACTURER.

These operational spare parts shall be supplied by MANUFACTURER, only after confirmation by COMPANY through written order(s) during duration of PURCHASE CONTRACT.

MANUFACTURER shall provide details of operational spare parts within sixty (60) days from the date of this PURCHASE CONTRACT in COMPANY prescribed format along with complete technical details/catalogue. This timely submittal is essential for COMPANY to confirm the requirement of spare parts as per the stipulated time.

The parts data package shall include the following.

- All required data by COMPANY and cross references (Part No., Designation No., Drawing and Position No., Model No., Catalog No., Communication No., Product Code No., etc.) of spare parts of equipment and for each sub-assembly or auxiliary equipment that is identified by a unique model number or serial number.
- A complete bill of materials with appropriate drawings illustrating and identifying all parts/components in their respective positions on each item of equipment.

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 MANUFACTURER'S list of all interchangeable parts/components if any, between MANUFACTURER'S equipment.

Type/Model/Make of spare parts indicated by COMPANY are tentative only. Correct type/model/make against each item of spare parts shall be supplied based on drawings approved by COMPANY. As per MANUFACTURER indicate that an item of spare parts is Not Applicable (N/A), MANUFACTURER shall be verified.

For more detail, refer to **Appendix-5**.

3.25 TRAVELING REQUIREMENTS

The Manufacturer shall provide round trip transportation/airfare, accommodations and food for the selected COMPANY personnel that will participate in the different activities as indicated on the relevant sections of this SOW/TS, based on the following minimum requirements:

- 1. For the airfare transportation requirements, Manufacturer shall provide IATA (International Air Transport Association) standard business class round-trip airfare tickets from international Airport in Saudi Arabia to the activity's locations.
- 2. For the ground transportation requirements, to/from activities locations to hotels/airports/restaurants which participants will be utilizing as well as for ground transportation from participants homes locations to Airports, the Manufacturer shall provide ground transportation through use of established and reputable taxi/limousine services for these COMPANY personnel.
- 3. For accommodations portion, Manufacturer shall provide accommodations for the COMPANY selected participants in either five stars, or four stars hotels if fivestar hotels are not available in/near the city of the activities. Also, each COMPANY participant shall be provided with both breakfast and dinner ("buffet style") and unlimited Wi-Fi connection for the entire duration of hotel stay. Manufacturer shall provide a buffet style Halal lunch either at activities locations/facilities, or at a hotel/restaurant for each of the COMPANY participants for the entire duration stay.
- 4. Manufacturer shall provide flight tickets and hotel reservation to the COMPANY personnel at least three (3) weeks before the scheduled flight for proper coordination.
- 5. International phone calls (within 20 minutes/day), internet/mobile Data (3GB/day), laundry services, water & juices shall be provided for COMPANY Personnel.
- 6. Additionally, the Manufacturer shall be responsible for obtaining the necessary entrance VISA to the country (or countries) of the activities, locations and the Manufacturer shall pay the required entrance VISA, VISA application fees, and accommodation and transportation required to issue VISA for each COMPANY participant.

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3.26 TECHNICAL ADVISORY SERVICES

Installation, testing and commissioning work of EQUIPMENT shall be borne by SUBSTATION CONTRACTOR under direct MANUFACTURER supervision.

MANUFACTURER shall provide complete SITE installation, testing and commissioning procedures for the EQUIPMENT supplied to SUBSTATION CONTRACTOR one (1) month before shipment as per COMPANY specifications/requirements.

The duration of supervision of Installation, testing and commissioning as per COMPANY specifications and requirements is twenty five (25) working Man-days for one (1) power transformer EQUIPMENT. In the supervision duration, involving numbers of trips of supervisors as required, cost of MANUFACTURER' supervisor(s) including air ticket to PROJECT SITE and back, VISA, insurance, food and accommodation, local transportation from Hotel to Job site and back shall be arranged and borne by MANUFACTURER.

SUBSTATION CONTRACTOR will intimate and notify MANUFACTURER three (3) weeks in advance the supervision schedule and the required date of supervisor availability at PROJECT(S) SITE and MANUFACTURER shall arrange accordingly and obligate to this supervision schedule.

WORKING HOURS:

During the construction phase of the PROJECT, MANUFACTURER shall work during the normal working hours of the COMPANY, i.e. 7:00 AM to 3:00 PM unless otherwise instructed by the COMPANY. The MANUFACTURER shall coordinate with the COMPANY to get Access Permit to PROJECT(S) SITE before commencing the job. The MANUFACTURER shall coordinate with the SUBSTATION CONTRACTOR for performing supervision work.

3.27 TRAINING REQUIREMENTS

FACTORY TRAINING:

MANUFACTURER shall submit training program for COMPANY review and approval.

MANUFACTURER shall arrange factory training complete with all required instructional materials complying with COMPANY requirements as per Appendix-III.

Training session(s) shall be arranged by MANUFACTURER, only after confirmation by COMPANY through a written notice during PURCHASE CONTRACT duration.

MANUFACTURER shall provide travelling requirements for COMPANY personnel as specified in section 3.26.

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				SIT	ΓΕ TRAINING:					
					TE demonstration during installation, MANUFACTURER supervisor(s).	testing and	commi	ssioning shall b	oe conduc	eted
TION			3.28	WA	ARRANTY					
DESCRIPTION				a)	The EQUIPMENT/MATERIALS to be free of defects in design, engineering standards/specifications contained	, materials o	or workı	manship and co		
				b)	MANUFACTURER shall provide was supplied against any defects arisin material or workmanship/manufactor the date of delivery or twelve (12) material whichever comes first. In addition, qualification conditions to be applied	g out of fauring for a ponths from warranty	ulty des eriod of EQUIPI requirer	sign/engineerin eighteen (18) MENT technica nents specified	g, defect: months fi I complet	s in rom tion,
Ö -	- ^	ı m		c)	If at any time prior to or within	the warra	ntv nei	iod COMPAN	Y found	the
RE	EVISION	IS		٥,	EQUIPMENT to be defective, MANU	FACTURER	shall re	pair or provide	replacem	ent
DEP ENGINEE	PARTME		of the same on priority to the full satisfaction of COMPANY without any cost a to COMPANY. Should MANUFACTURER refuse to undertake the corrective						-	
	EPARED		1		then COMPANY has the right to per corrective work at MANUFACTUREF		e other:	s perform some	e or all of	the
DATE:	KNT LN. AL F. 15 / 08	/ 2024		d)	If, pursuant to the above, MANUFA work, the warranty set forth above materials or equipment provided by twelve (12) months from the actual	shall apply MANUFAC	to suc	ch corrective w /COMPANY fo	ork and r a period	any d of
	ROVED oup Lead				work.	·		, ,		
e) The warranty certificate from MANUFACTURER in original (in MANUFACTU Original Letterhead) shall be furnished by MANUFACTURER after complet delivery.										
E&DD-	EOA DIV	ISION		f)	MANUFACTURER'S liability under to by vandalism, improper installation/		•		efects cau	sed
AMEEN	H. AL-H	ULAIMI			END OF S	SECTION 3				
THIS DOO	USE JCTION G MA	T IS NOT D FOR OR FOR ATERIALS								
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PTS-

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NG2150

SAUDI ARABIA

TRANSFORMERS AND REACTORS

CT-926693

NO. DESCRIPTION SAUDISIANA 1 3 3

DEPARTMENT
ENGINEERING & DESIGN

PREPARED BY Project Engineers

KHF KUMAIL N. AL-FASHKHI

DATE: 15 / 08 / 2024

APPROVED BY Group Leader

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED

SECTION 4 SCOPE OF WORK

4.1 GENERAL

The MANUFACTURER shall design, engineer, manufacture, factory test, supply and supervise installation, testing and commissioning of Power Transformers EQUIPMENT complete with all accessories along with all associated work and services in a satisfactorily manner as specified in this scope of work and technical specifications, whether specifically mentioned/specified in detail or not shall be supplied as necessary.

4.2 TRANSFORMER EQUIPMENT & FACILITIES

A. 50/67MVA, POWER TRANSFORMERS

Design, engineer, manufacture, factory test, supply and supervise installation, testing and commissioning of 50/67MVA, ONAN/ONAF, 3-phase, 60 Hz., oil immersed power transformers with OLTC, HV outdoor bushings & MV cable boxes (LV with XLPE cable to air bushing and MV cable box shall be suitable for 6-630mm² per phase or LV Bus, as applicable), brackets for mounting surge arresters, complete with bushing CTs, all appurtenances and accessories.

- 1. The power transformer shall be one of the following types as detailed in the drawings and data schedules attached with this PTS:
 - a) TR67-YNyn0+d1-132:

50/67MVA, 132/13.8kV, YNyn0+d1, X/R ≤ 58, 22% @ 50MVA and OLTC -20% to +12.5%.

b) TR67-YNyn0+d1-110:

50/67MVA, 110/13.8kV, YNyn0+d1, X/R ≤ 58, 22% @ 50MVA and OLTC -20% to +12.5%..

c) TR67-Dyn1-132:

50/67MVA, 132/13.8kV, Dyn1, X/R \leq 58, 22% @ 50MVA and OLTC -20% to +12.5%.

d) TR67-Dyn1-115:

50/67MVA, 115/13.8kV, Dyn1, X/R \leq 58, 22% @ 50MVA and OLTC -20% to +12.5%.

2. Stabilizing winding (if applicable) shall be determined by the MANUFACTURER with calculations based on dynamic short circuit withstanding capability. The rating

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CT-926693

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	TRANSFORMERS AND REACTORS SAUDI ARABIA	NG2150	A	PTS- 24CM1046	45 OF 60	01

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APPROVED BY Group Leader

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shall be guaranteed by the manufacturer and **shall be at least one-third (1/3) of the power rating of the secondary winding as per clause 4.3.7 of 53-TMSS-01.**

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The voltage rating of the stabilizing winding (if applicable) shall be 6.6kV having the BIL rating of minimum 60kV_{peak}.

Tertiary stabilizing windings shall be open Delta connection. The two terminal of the open corner shall be brought outside through two outdoor bushings and shorted externally. Moreover, the same shall be brought to the bottom of the Power Transformer through grounding leads/bars as per clause 4.21 of 53-TMSS-01 Rev.02.

3. The power transformer grounding shall be as follows:

HV Side:

The transformers with "Y" connection at HV shall be solidly grounded. The HV winding can be either uniform or graded insulated. The BIL of the graded HV winding (if applicable) shall be minimum 170kV_{peak}.

MV Side:

The MV side grounding shall be either one of the following types:

- i. Solidly grounding.
- ii. Grounding through neutral grounding resistor (NGR; which shall be provided by the substation CONTRACTOR).
- 4. The power transformer shall be provided with the following bushing CTs as detailed in the drawings and data schedules attached with this PTS:

a) Metering CTs:

CT#	Ratio [A/A]	Class	Burden [VA]
LV Bushing CT	(Only on 'y' Phase)		
CT-1	2803 / 1	0.5	30

Winding temperature indicator (WTI) CT shall be decided by MANUFACTURER.

b) Protection CTs:

Refer to Appendix-3.

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CT-926693	TRANSFORMERS AND REACTORS SAUDI ARABIA	NG2150	A	PTS- 24CM1046	46 OF 60	01

الشركة الوطنية لنقل الكهرباء **National Grid SA** Note that the total guaranteed ONAN losses shall not exceed 209 kW. B. 80/100MVA, POWER TRANSFORMERS Design, engineer, manufacture, factory test, supply and supervise installation, testing and commissioning of 80/100MVA, ONAN/ONAF, 3-phase, 60 Hz., oil immersed power transformers with OLTC, HV outdoor bushing & LV cable boxes (LV with XLPE cable to air bushing and LV cable box shall be suitable for 3-1000mm² per phase), brackets for mounting surge arresters, complete with bushing CTs, all appurtenances and accessories.

> 1. The power transformer shall be of the following rating as detailed in the drawing and data schedule attached with this PTS:

TR100-YNyn0+d1-132:

80/100MVA, 132/33kV, YNyn0+d1, X/R ≤ 50, 14% @ 80MVA and OLTC -15% to +10%.

2. Stabilizing winding shall be determined by the MANUFACTURER with calculations based on dynamic short circuit withstanding capability. The rating shall be guaranteed by the manufacturer and shall be at least one-third (1/3) of the power rating of the secondary winding as per clause 4.3.7 of 53-TMSS-01.

The voltage rating of the stabilizing winding shall be 13.8kV having the BIL rating of minimum 95kV_{peak}.

Tertiary stabilizing windings shall be open Delta connection. The two terminal of the open corner shall be brought outside through two outdoor bushings and shorted externally. Moreover, the same shall be brought to the bottom of the Power Transformer through grounding leads as per clause 4.21 of 53-TMSS-01 Rev.02.

3. The power transformer grounding shall be as follows:

HV Side:

The transformers with "Y" connection at HV will be solidly grounded. The HV winding can be either uniform or graded insulated. The BIL of the graded HV winding (if applicable) shall be minimum 170kV_{peak}.

MV Side:

The LV side grounding shall be either one of the following types:

i. Solidly grounding.

ġ REVISIONS

DEPARTMENT **ENGINEERING & DESIGN**

> PREPARED BY **Project Engineers**

KNF

KUMAIL N. AL-FASHKHI

DATE: 15 / 08 / 2024

APPROVED BY Group Leader

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DEPARTMENT
ENGINEERING & DESIGN

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KUMAIL N. AL-FASHKHI DATE: 15 / 08 / 2024

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National Grid SA

iii. Grounding through neutral grounding resistor (NGR; which shall be provided by the substation CONTRACTOR).

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4. The power transformer shall be provided with the following bushing CTs as detailed in the drawings and data schedules attached with this PTS:

a) Metering CTs:

CT#	Ratio [A/A]	Class	Burden [VA]
LV Bushing CT	(Only on 'y' Phase)		
CT-1	1750 / 1	0.5	30

Winding temperature indicator (WTI) CT shall be decided by MANUFACTURER.

b) Protection CTs:

- Refer to **Appendix-3**.
- 5. Note that the total guaranteed ONAN losses shall not exceed 254kW

C. General Requirements for All Power Transformers

The following requirements shall be specifically complied with for Power Transformers.

a) General

The power transformers shall be equipped with **Vacuum Coarse fine** On Load Tap Changer (OLTC) located at the HV winding and suitable for operating with Remote Tap Changer Control Panel (RTCC) to be supplied by others. The step voltage for the taps shall be 1.25%.

The full capacity of the power transformer shall be available at all positions of the tap. The OLTC and all other current carrying accessories shall be rated for 120% of the current corresponding to highest current tap.

OLTC shall be provided with an over-current blocking device to stop the motor-drive mechanism of the On Load Tap Changer from operating when the transformer load current exceeds a pre-set overload limit as specified in the clause 5.7.3 of IEC 60214.2.

- b) The detail of the location of CT's for winding temperature indicators shall be furnished to the COMPANY for review and approval.
- c) The power transformers oil in all respect shall be as per 54-TMSS-01.

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- d) Online Gas Analyzer is not required under this Contract. However, Power Transformers shall be design to have the required provision to the same for future use.
- e) Power Transformers with outdoor HV Bushings shall be provided with 96, 108 or 120 kV; as applicable outdoor, station class, metal-oxide Surge Arresters that to be mounted on the designated power transformers brackets.
- f) During shipment, each power transformer tank shall be fitted with two (2) impact recorders, each one capable of measuring the impact in three (3) directions. Downloading of impact recorder Recordings shall be done at National Grid SA designated office. It shall be the MANUFACTURER's responsibility to provide necessary interface hardware/software for the same.

The type of impact recorder to be fixed on the power transformer tank while transporting per 5.2 of 53-TMSS-01 is subject to National Grid SA approval.

In case of any defect/failure of impact recorder during transit, National Grid SA may ask the MANUFACTURER to give extended warranty period. Therefore, extra care shall be exercised for installing the correct impact recorder.

MANUFACTURER shall submit catalogue copies of proposed impact recorder for National Grid SA review and approval.

- g) The optical fiber sensors for hot spot measurements of the power transformer as per 4.6.3 of 53-TMSS-01 shall be provided and terminated in power the transformer LCC.
- h) As per clause 4.6.3.f of 53-TMSS-01, Fiber optic sensors shall be provided with monitoring system. The system shall be fully integrated with SAS at bay level using IEC 61850 and also at station level integration with the HMI for analyzing purposes. Monitoring system software shall be compatible with all SAS Software's. This monitoring system shall support PRP.
- MANUFACTURER shall design the power transformers with wheel moving facilities which can be detached at SITE and used as SKID type base power transformers based on SITE conditions.
- j) MANUFACTURER shall arrange to ship sufficient quantity of oil including wastage/contingency to avoid any delay in SITE activities.
- k) The MV cable box shall be at 3 o'clock position when facing HV bushings.
- I) To connect Power Transformer to substation MV Switchgear, MV cable box shall be designed to Accommodate either:

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				i. Six (6) cable per phase (6x ⁻ for 50/67 MVA Power Tra supper clean XLPE for 80/	nsformers	or 3x10	Cx1000mm2, C			
NOI				m) In case Condenser bas bar connectio to connect Power Transformer to s Insulated Condenser Bus Bars & Asso	substation	MV Sw	itchgear throu	_		
DESCRIPTION				Bus Bars suit per phase a Power Trans 3600A/2500	table for M\ s per 32-T sformers \ A, Transfor	/, 3600 A MSS-08 with the mer Ind	bars comprisin A/2500A, 60Hz B, connecting The compartme Comer Switch Cassembly, har	25kA/1 s MV side ent of M gear Pane	ec of IV, els	
				n) The cantilever strength of all the bush	nings shall b	pe as pe	er IEC 60137.			
Ŏ.	-	2	က	o) The COMPANY may request the MAN	IUFACTURE	ER for th	ne following:			
	REVI	SIONS		i. To provide the power trans	eformer(e) l	HV sida	with HV cable	hov (HV v	with	
	DEPARTMENT ENGINEERING & DESIGN			XLPE cable to oil bu appurtenances and acces	shing), co sories. The	mplete HV cab	with bushin le box shall be	g CT's, suitable f	all	
F	PREPA Project	ARED B Engine		1.1-400mm² per pha 2.1-630mm² per pha		-		` '		
	#H JMAIL N. ATE: 15			ii. For power transformer(s) t than 1000m up to 3000 accessories (including bu	om (if appl shing dime	licable), nsions),	the power transfer the shall be proper	ansforme	r(s)	
	APPRO Group	VED BY		to meet the specific enviro	nment requ	uremer	its.			
	ALIL I. A			iii. All parts of Control Cabine staircase ladder shall be p	=	all be a	ccessible. Othe	rwise		
	CERTIF	FIED BY		p) <u>Power Transformer Tests</u>						
L	MANAGER (A)			Type, Routine and special Test shall be carried out on the Power Transformers under this purchase contract as follow:						
i. Type Tests, as per 53-TMSS-01, shall be carried out only on one represe unit for each type of Power Transformer under this Purchase Contract.							-	tive		
TO CONS ORDE	TRUCT RING L CER	USED TION OF MATE	FOR R FOR RIALS	ii. Routine Tests, as per 53-TMSS-01 under this Purchase Contract.					iers	
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6.3.1 of 53-TMSS-01, shall be carried out Purchase Contract. All other special te ied out only on one representative Po	ests

iii. All Special Tests listed under clause 6.3.1 of 53-TMSS-01, shall be carried out on all Power Transformers under this Purchase Contract. All other special tests required per IEC/ANSI shall be carried out only on one representative Power Transformer unit for each type of Power Transformer under this Purchase Contract.

4.3 HV SHUNT REACTOR EQUIPMENT & FACILITIES

A. 132KV, BUS SHUNT REACTORS

Complete 132kV Bus Shunt Reactor(s), **40 MVAR** shall be supplied, including all bushings, bushing current transformers, monitoring sensors/ devices and other accessories.

S/NO.	SPECIFICATION	RATING	UNITS	REMARKS
1.	Ambient	55°C		Outdoor
	Temperature			
2.	Short Circuit	40	kA	
	Current Rating			
3.	Bushings	OIL/XLPE		
		OIL/AIR		
		OIL/SF6		
4.	Frequency	60	Hz	
5.	Neutral	Solidly		
	Grounding			

B. SHUNT REACTORS DESIGN CRITERIA

Shunt Reactors shall be design with following criteria

- a) The CONTRACTOR shall conduct suitable studies to design. Reactors shall have non-linear windings with a minimum 'k factor' of 1.4 of magnetic flux linkage peak value (p.u).confirming to COMPANY & relevant IEC/IEEE Standards
- b) The bushing of the Shunt Reactors shall be designed for a higher BIL rating. CONTRACTOR shall provide calculation to prove the adequacy of the BIL rating.
- c) Substation Contractor shall carry out the OVER VOLTAGE studies as defined in insulation coordination study requirements. Manufacturer shall coordinate with contractor for this study to ensure that reactor design is in line with the results.
- d) Reactor manufacturer shall check that equipment must not fail due to high frequency (0.2 MHz 2 MHz), resonance, ferro-resonance etc.

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DEPARTMENT				

ENGINEERING & DESIGN

PREPARED BY
Project Engineers

KHF KUMAIL N. AL-FASHKHI

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						s of Control Cabinet shall be provided.	panels	shall	be acc	essible.	Otherw	ise stai	rcase										
				·		ACTURER shall ned design/studies.		nate	with	CONTRA	ACTOR	for a	above										
DESCRIPTION				4.4 PROTECTION																			
DESC				Refer to Appe				FIONG	S AND I		00												
				4.5 <u>CONTRACT I</u>	<u>JESIGN</u>	DOCUMENTS, CAL	LCULA	HUNS	S AND I	<u>JKAWIN</u>	<u>65</u>												
						ERS shall submit a stages of the CONT	-																
						Tabl	e 4.01																
				SECTIONS	S/N	Documents	TRAN		MER PUI	RCHASE	CON	OURING STRUCTI STAGE	ON										
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ENG			SIGN	A COMPLIANOE	A.2	01-TMSS-01	Х		Χ														
,				A. COMPLIANCE STATEMENT	A.3	31-TMSS-06			Χ														
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	TE: 15 /				C.1	Short Circuit Calculation	,		X	X													
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C	Why	C. CALCULATION TECHNICAL D. DOCUMENT IS NOT BE USED FOR		C. CALCULATIONS &	C.3	Thermal Damage Curve		х		Х													
												II. AE HOLAIWII		TECHNICAL DATA	C.4	Through Fault Withstand Curve			Χ	Х			
THIS TO					C.5	Inrush Current		Х		Х													
CONS ORDE UNTI	CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED		FOR RIALS		C.6	Over excitation Curve			Х	Х													
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								Bid Stage		minary sign	Final Design	Manufac Stag		Built Stage												
DESCRIPTION						C.7	Overloading Curve/Calculation at ambient temperature			Х	Х															
						C.8	BH Curve of proposed core material from core MANUFACTURER & overflowing capability of core indicating the saturation value.			X	X															
						C.9	Cooling System Details and Calculations			Х	Х	Х														
NO.	1	2	ဗ			C.10	Transformer/reactor Grounding Details			Х	Х	Х														
	DEPARTMENT ENGINEERING & DESIGN PREPARED BY Project Engineers		MENT & DESIGN			C.11	AC/DC Load requirements for Transformer/reactor and accessories			Х	х	х														
P						C.12	Technical details for Impact Recorder.			Х		Х														
KU	ÆA IMAIL N.	VF ALFASI	нкні			D.1	Drawing Control Sheet			Χ	Х	Х		Х												
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AME			AL-HULAIMI											D.5	AC/DC Power & control schematic diagram for Transformer/Reacto r and Accessories.			Х	х	х		х				
TO CONS					D.6	Foundation Detail for Transformer & Reactor			х	Х	Х															
	. CER					D.7	Shipping Drawing			Х	X	Х														
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SECTIONS	S/N	Documents	TRAN	ISFORMER PUI CONTRACT	RCHASE	DURING CONSTRUCTION STAGE	
SECTIONS	3/N	Documents	Bid Preliminary Final Stage Design Design		As Manufactured Stage	As Built Stage	
	D.8	Detail Valve Location Plate		Х	Х	X	
	D.9	OLTC Catalogue		Χ	Х		
	D.10	Accessory Catalogues		Х	Х		
	E.1	QA/QC Plan	Χ	Χ			
	E.2	Type Tests Report for Transformer/Reacto r & OLTC	Х	Х			
	E.3	Inspection Test Plan Type Tests		Х			
E. Test Plan & Procedure	E.4	Inspection Test Plan Routine Tests		Х			
	E.5	Site Test Procedure		Χ			
	E.6	Painting Procedure & Specification		Х			
	E.7	Sub supplier List		Χ		Χ	
	E.8	Technical Data Manuals			Х	X	

Notes for the Above Table:

- 1. Drawing control sheets shall be provided at every stage.
- 2. All design documents/calculations shall be provided in PDF format, along with the other requirements mentioned in PTS SOW/TS, at every stage.
- 3. All Drawings shall be provided in Microstation and PDF formats, along with the other requirements mentioned in PTS SOW/TS, at every stage.
- 4. All calculations, studies, reports, drawings/sheets, MANUFACTURER/Vendor drawings/sheets shall be given standard National Grid SA drawing numbers and format in accordance with SEEDS-II and the same shall be included in the drawing control sheet as part of Project drawings/calculations.
- 5. "As-Manufactured" and "As-Noted" drawings shall be submitted to SUBSTATION CONTRACTOR for incorporating field changes.
- 6. As-built drawings shall incorporate all the field changes (SUBSTATION CONTRACTOR will provide the mark up for field changes).

			. ,			•
DRAWING CONTROL SHEET	FINAL SOW/TS FOR PURCHASE CONTRACT FOR	PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.
CT-926693	TRANSFORMERS AND REACTORS SAUDI ARABIA	NG2150	A	PTS- 24CM1046	54 OF 60	01

ġ REVISIONS

DEPARTMENT

ENGINEERING & DESIGN

PREPARED BY **Project Engineers**

KNP KUMAIL N. AL-FASHKHI DATE: 15 / 08 / 2024

APPROVED BY Group Leader

Jess -KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

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				National Grid	SA			دا	الشركة الوطنية لنقل الكهرباء كه					
				7.	As built drawings are rec	quired as pe	er "Engineeı	ring Dra	wing Standard	"SEEDS-II	l.			
				4.6 <u>STA</u>	4.6 STANDARDS, CODES AND SPECIFICATIONS									
DESCRIPTION				lates lates	VORKS equipment and net edition of the COMPANET applicable industry standard and specification sh	IY'S Materi dards, cod	al Standard es and spec	l Specif cification	ications supplens. The latest e	emented v dition of e	with			
1				spec writt and	The CONTRACTOR shall strictly comply with the following standards, codes and specifications, and no deviation shall be accepted unless otherwise accepted by a written waiver from COMPANY. The CONTRACTOR may propose "equivalent" standards and specifications if such standards and specifications are equal to or better than those specified herein, and shall be subject to prior approval of the COMPANY.									
				#	Std/Sepc. No.	Title/Des	scription							
				A.	A. <u>Saudi Arabian Standards</u>									
NO.	Ö – α π				SASO 39/1978	Mechani	cal Test of	Welded	Joints					
	REVIS	SIONS			SASO/SSA-53	Graphic	Symbols							
	DEPAR	TMENT												
ENG	NEERIN	IG & DE	B. COMPANY Materials Standard Specifications											
	PREPA Project E	RED BY			01 71400 01	OFNEDA	. 55	0111051	AENTO E					
	Æħ	TP			01-TMSS-01	EQUIPMENT/MATERIALS					ALL			
	JMAIL N.				31-TMSS-06	TERMINAL BLOCKS								
DA	ATE: 15	/ 08 / 2	024		35-TMSS-01	SURGE A	ARRESTER							
	APPRO	VED BY			53-TMSS-01	POWER	TRANSFOR	MERS I	RATED ABOVE	2.5 MVA				
	Group	Leader			58-TMSS-01				33 KV THROUC					
	ALIL I. A				54-TMSS-01	MINERA APPARA		ATING	OIL FOR	ELECTRIC	CAL			
DA	TE: 15 /	08 / 20	124			<u> </u>								
E&	CERTIF DD-EOA MANAG	DIVISI			Note: All blanks on the (for TMSS) shall be without omission an technical proposal.	properly fil	led-up by t	he MAN	NUFACTURER ((as requir	ed)			
АМІ	EEN H. A	AL-HUL/	AIMI											
DA	TE: 15 /	08 / 20)24	C.	COMPANY Engineeri	ng Standaı	rds							
TO CONS	DOCUM BE U STRUCTI RING	JSED ION OR	FOR FOR		TES-H-107.01	TES-H-107.01 Painting Standards								
UNTII DATE	L CER	TIFIED	AND		TES-H-107.02	Paint Co	lor Codes a	nd Stan	dards					
							1	•						
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				National Grid S	SA.			اء	ية لنقل الكهرب	كة الوطنا	الشر
				#	Std/Sepc. No.	Title/Des	scription				
					TES-P-119 TES-W-109.01		on Design S Welding Cri		ds		
					TES-S-101.01	+	nd Security		rds		
DESCRIPTION				D.	COMPANY Constru	ction Standa	ards				
					TCS-P-105		missioning ssion Electr		Procedures fo tallations	r COMPA	NY
				E.	Other Standards						
					SEEDS-II	Standard		aring, I	ny Engineerin Processing an cuments	-	_
S - Ν Θ REVISIONS						END OF S	ECTION 4				
	DEPAR										
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	## JMAIL N.										
	APPRO Group										
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NO. DESCRIPTION 1 SUCCESSORITION 2 SUCCESSORITION

DEPARTMENT
ENGINEERING & DESIGN

PREPARED BY Project Engineers

KUMAIL N. AL-FASHKHI DATE: 15 / 08 / 2024

APPROVED BY Group Leader

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

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SECTION 5 DESIGN CRITERIA

The MANUFACTURER shall adopt the design criteria indicated below as a minimum for this purchase contract.

5.1 ENVIRONMENTAL CONDITIONS

All equipment, materials, devices and their specified ratings furnished under this PROJECT shall be suitable for operation as outlined in TES-P-119.02 and 01-TMSS-01.

5.2 ELECTRICAL DESIGN REQUIREMENTS

A. General

- 1. The system design parameters shall be in accordance with the requirements outlined in COMPANY Standard TES-P-119.02 and hereunder:
 - a. The short circuit rating of 132 kV or 115 kV or 110kV systems is 40kA for one (1) sec. (Sym.).
 - b. The short circuit rating of the 33kV system is 25kA for one (1) sec. (Sym.).
 - c. The short circuit rating of the 13.8kV system is 25kA for one (1) sec. (Sym.).

2. <u>Computer Calculations</u>

If computer software is used in design calculations/studies, then the details regarding the name of the software, its version etc. shall be clearly indicated in the corresponding submittals and shall be accompanied by soft copy of the input and output files. Assumptions made (if any) shall be clearly highlighted with appropriate justification/supporting document for the assumed values. The data provided to the computer as an input shall be clearly distinguished from those computed by the program. A program description document (user's guide) and a copy of the software (on returnable basis) shall be made available upon request by the COMPANY and shall contain the information necessary to determine the nature and extent of the analysis, verify the input data, interpret the results, and determine whether or not the computations comply with these recommendations.

B. Auxiliary Supply Voltage

<u>Description</u>	<u>Voltage</u>
Supply Voltage for DC System	125V DC (Ungrounded)
Supply Voltage for Auxiliary Circuits	400/230V AC, 3Ø, 4 wire

END OF SECTION 5

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CT-926693	TRANSFORMERS AND REACTORS SAUDI ARABIA	NG2150	Α	PTS- 24CM1046	57 OF 60	01

NO. DESCRIPTION 1 2 2

REVISIONS

DEPARTMENT
ENGINEERING & DESIGN

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KHF KUMAIL N. AL-FASHKHI

DATE: 15 / 08 / 2024

APPROVED BY Group Leader

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

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SECTION 6 EQUIPMENT/MATERIALS & TECHNICAL SPECIFICATIONS

6.1 GENERAL

This section outlines broadly the technical specifications of the major equipment/materials required for this CONTRACT. The specifications outlined herein shall be read in conjunction with the attached CONTRACT drawings, the COMPANY Material Standard Specifications and the associated international standards and codes. The ratings and specific requirements of the various electrical equipments shall be as indicated in data schedule of COMPANY Material Standard Specifications, and the MANUFACTURER shall ensure full conformity with the same.

6.2 ELECTRICAL EQUIPMENT

All equipment/materials shall conform to the related COMPANY standards and other standards in accordance with the tabulation hereunder (Table 6.01):

Table 6.01

Serial No.	EQUIPMENT/MATERIAL	COMPANY Standards/ Other Standards
1.	132/13.8kV, 50/67 MVA Power Transformers 115/13.8kV, 50/67 MVA Power Transformers 110/13.8kV, 50/67 MVA Power Transformers	53-TMSS-01
2.	132/33kV, 80/100 MVA Power Transformers	53-TMSS-01
3.	132kV, 40MVAR Bus Shunt Reactor	58-TMSS-01
4.	Transformer Oil	54-TMSS-01
5.	Terminal Blocks	31-TMSS-06
6.	Surge Arrester	35-TMSS-01

Notes:

1. Power Transformers/Reactors

a. Design Parameters

- i. Power transformers/Reactors shall conform to the additional requirements per attached data schedules.
- ii. The power transformer shall be equipped with an on-load tap changer (OLTC), which shall be derived by the remote tap changing controller (RTCC) through IED located in transformer bay control panel and all functions of tap changer control will be integrated with SAS. Moreover, contacts of oil gas/surge relay for OLTC, contact of pressure relief

DRAWING CONTROL SHEET	FINAL SOW/TS FOR PURCHASE CONTRACT FOR	PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.
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				National Grid SA			دا	یه تنعن انجهرب	چه انوصد	السره
					device (main tank & C winding temperature ind tank & OLTC) and oth compatible with SAS (c IEDs).	dicator, buc er power t	hholz re ransfor	elay, oil level ind mers accessoi	licator (m ries shall	nain be
DESCRIPTION				iii.	Alarms of power transf be integrated with SAS.	ormers med	chanica	I protection, if	any, will a	also
DE					END OF S	ECTION 6				
O	F	2	е							
	REVI	SIONS								
	DEPARTMENT ENGINEERING & DESIGN									
	PREPARED BY		Y							
F	Project	Engine	ers							
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:	APPRO Group									
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				National Grid SA		اء	بة لنقل الكهربا	كة الوطنب	الشر
				SECTION 7 SUPERVISION OF EQUIPMEN COMMISSIONING		TION, S	SITE TESTING A	AND	
				7.1 TRANSFORMER & REACTOR EQUIPMI	NT				
DESCRIPTION			A. MANUFACTURER shall provide complete site installation, testing and commissioning procedures for the Transformers to COMPANY/SUBSTATION CONTRACTOR in accordance with COMPANY testing and commissioning procedure (TCS-P-105). Site installation, testing and commissioning procedures for the power transformers shall be subject to COMPANY review and approval.					ION lure	
				B. MANUFACTURER shall supervise EQUIPMENT installation, site testing and commissioning of power transformers EQUIPMENT and related facilities.					
				C. The SUBSTATION CONTRACTOR will be responsible for providing temporary AC and DC power supplies needed to perform the commissioning and site tests. All tests shall be performed in accordance with the applicable IEC and ANSI Standards and established practices and procedures.					
Ö	- REVIS	NSIONS	ဧ	END OF SECTION 7 & SOW/TS					
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APPENDICES

FOR SCOPE OF WORK & TECHNICAL SPECIFICATIONS

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APPENDIX-2	MATERIAL DATA SCHEDULES
APPENDIX-3	PROTECTION REQUIREMENTS
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APPENDIX-5	OPERATIONAL SPARE PARTS REQUIREMENTS
APPENDIX-6	SPECIAL TOOLS & EQUIPMENT REQUIREMENTS

APPENDIX-1

DRAWING CONTROL SHEET & DRAWINGS

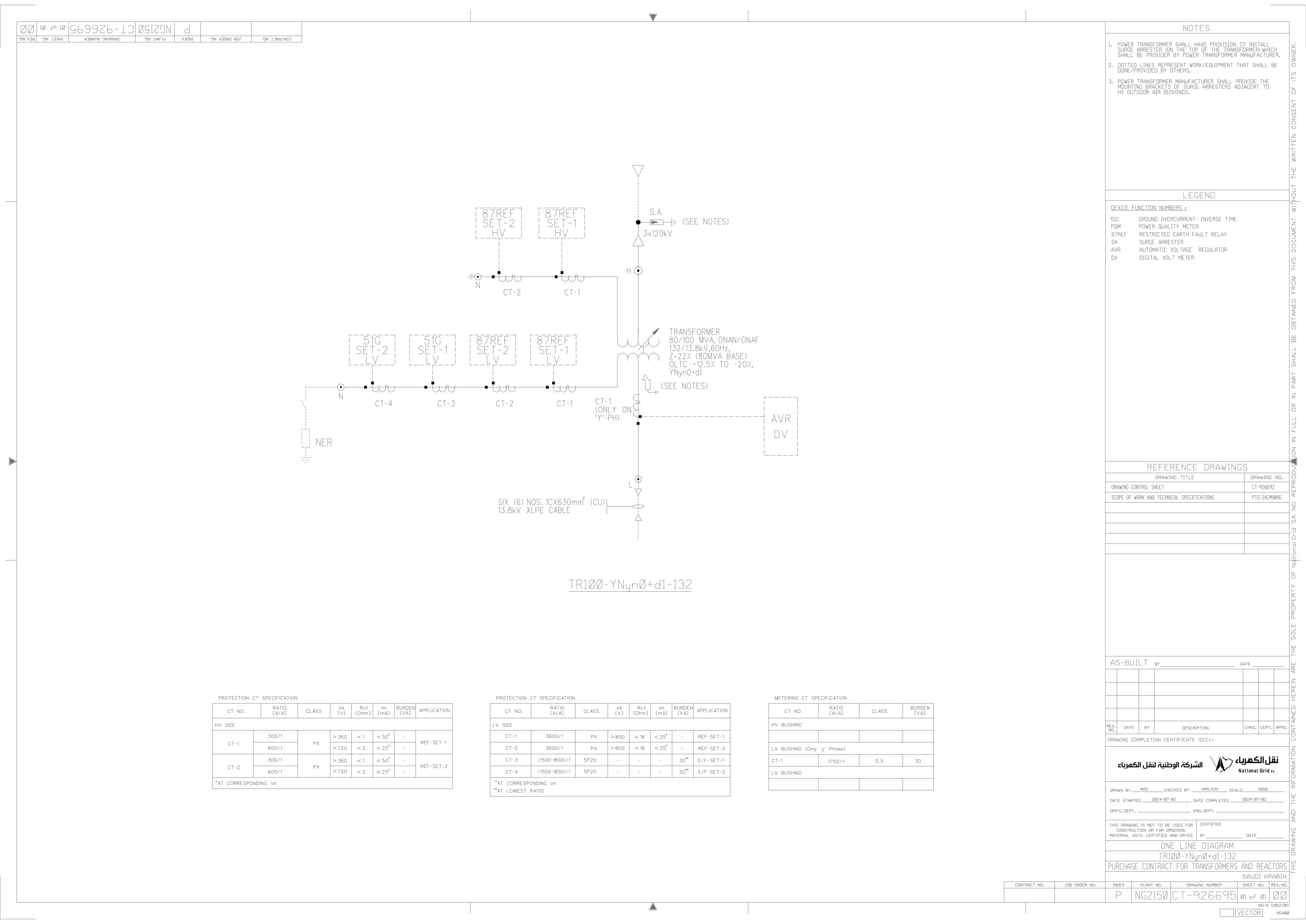
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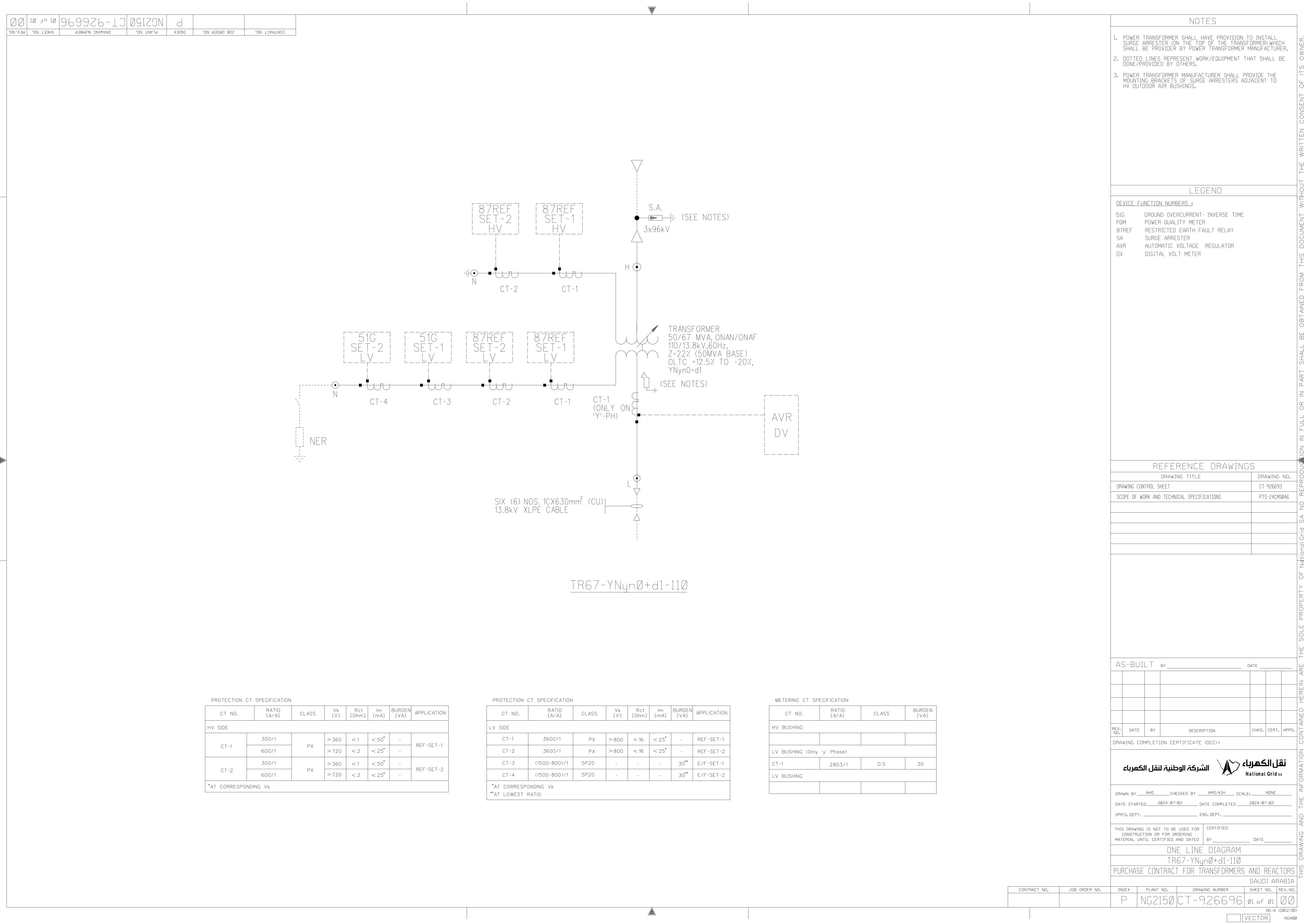
DRAWING CONTROL SHEET

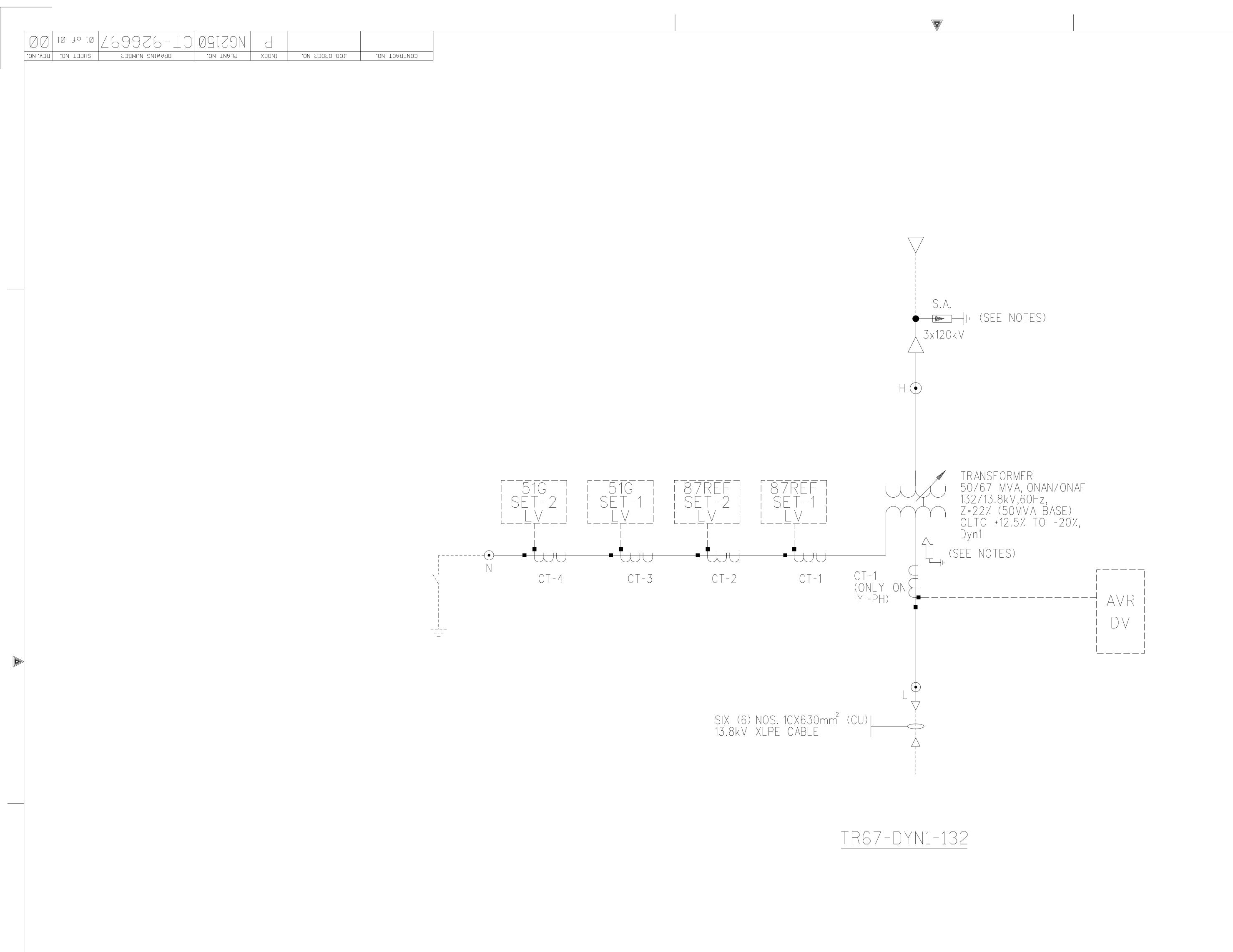
	ROJECT TITLE PURCHASE CONTRACT FOR TRANSFORMERS AND REACTORS				PROJECT MANAGER / ENGINEER ALI M. AL-SAIHATI		CODES		CONTRACT NO. :			DRAFTING OFFICE			
PURG							S/S	OHTL -	U/G	SAP NO. (JOB ORDER) :					
SAUDI ARABIA										NUMBER OF DRAWINGS S THIS SHEET : (19)				EDD-EOA/PSU	
DDEELY	DRAWING SUEST NO INITIAL REV.			DRAWING TITLE			FURTHER REV.		DEMANUE						
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СТ	926694	01 OF 01	!	PARE											
				INDEX-P											
СТ	926695	01 OF 01	0	DNE LINE DIAGRAM TR67-YNyn0+d1-132											
СТ	926696	01 OF 01	0	ONE LINE DIAGRAM TR67-YNyn0+d1-110											
СТ	926697	01 OF 01	0	ONE LINE DIAGRAM TR67-Dyn1-132											
СТ	926698	01 OF 01	0	ONE LINE DIAGRAM TR67-Dyn1-115											
СТ	926699	01 OF 01	0 (ONE LINE DIAGRAM TR67-YNyn0+d1-132											
CT	926700		0	PARE											
	TO														
СТ	926712		0 :	PARE											
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AS BUILT BY				PROJECT COMPLETION DATE PLANT NO. INDEX DRAWING NO. NG2150 X CT-926693				RE	0 V. NO.	SHEET NO. 01 OF 01					
	REVISION COLOR CODE			Rev.01	01 Rev.02	Rev.03 Re			Rev.06	Rev		Rev.09	Rev.10	Rev.11	Rev.12
REVISION COLOR CODE				kev.01	1 Kev.U2	KeV.U3	ev.04 Rev	7.05	KeV.Ub	ĸev	7.U7 Kev.U8	KeV.U9	kev.10	Kev.11	KeV.12

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DMS EXCEL







PROTECTION CT SPECIFICATION

CT NO.	RATIO [A/A]	CLASS	Vk [V]	Rct [Ohm]	lm [mA]	BURDEN [VA]	APPLICATION
LV SIDE							
CT-1	3600/1	PX	>800	< 16	< 25*	-	REF-SET-1
CT-2	3600/1	PX	>800	< 16	< 25*	-	REF-SET-2
CT-3	(1500-800)/1	5P20	_	-	-	30**	E/F-SET-1
CT-4	(1500-800)/1	5P20	-	-	-	30**	E/F-SET-2
*AT CORRESPONDING VK **AT LOWEST RATIO							

METERING CT SPECIFICATION

CT NO.	RATIO [A/A]	CLASS	BURDEN [VA]				
HV BUSHING							
LV BUSHING (Only 'y' Phase)							
CT-1	2803/1	0.5	30				
LV BUSHING							

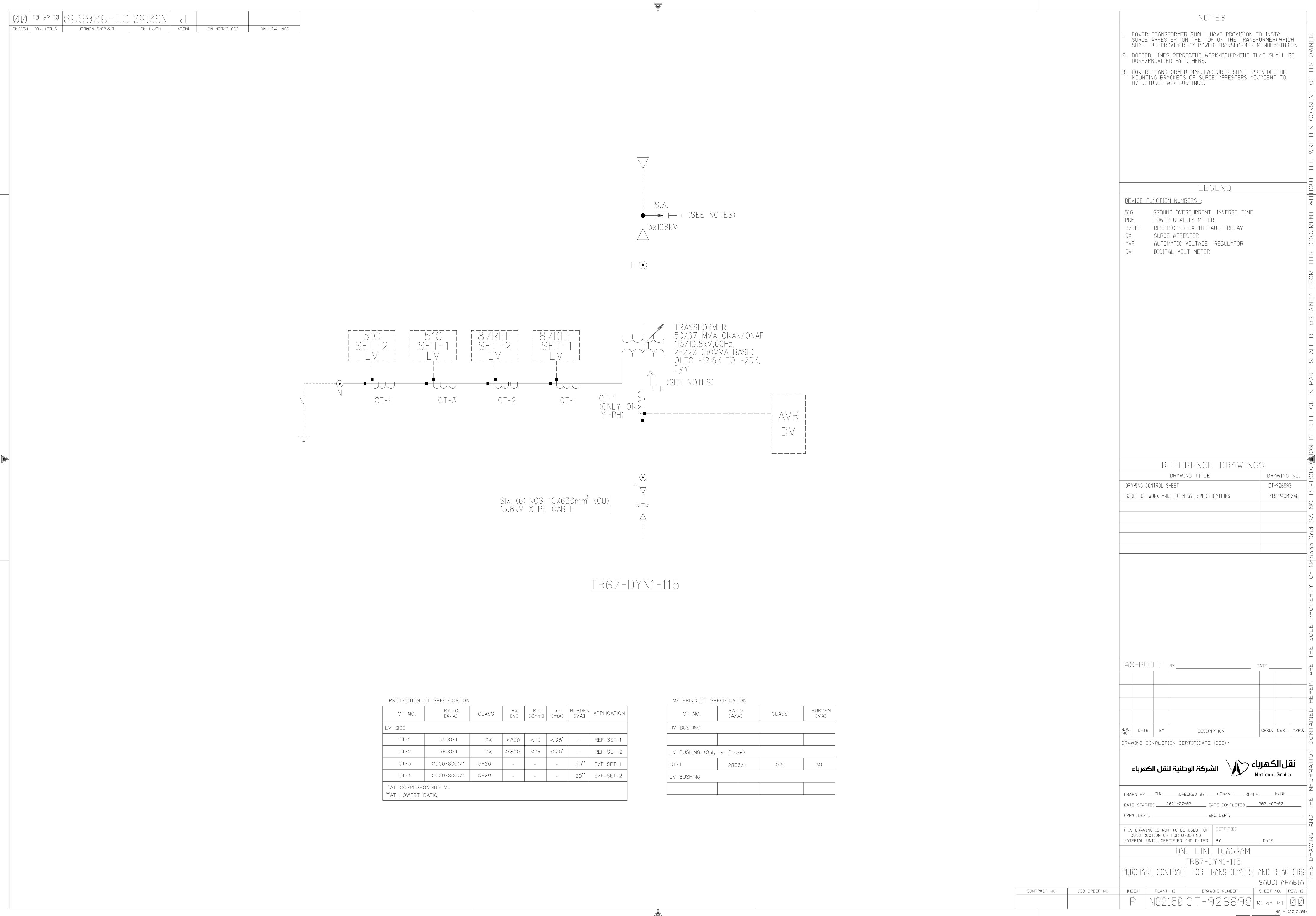
1. POWER TRANSFORMER SHALL HAVE PROVISION TO INSTALL SURGE ARRESTER (ON THE TOP OF THE TRANSFORMER) WHICH SHALL BE PROVIDER BY POWER TRANSFORMER MANUFACTURER. 2. DOTTED LINES REPRESENT WORK/EQUIPMENT THAT SHALL BE DONE/PROVIDED BY OTHERS. 3. POWER TRANSFORMER MANUFACTURER SHALL PROVIDE THE MOUNTING BRACKETS OF SURGE ARRESTERS ADJACENT TO HV OUTDOOR AIR BUSHINGS. LEGEND DEVICE FUNCTION NUMBERS : 51G GROUND OVERCURRENT- INVERSE TIME PQM POWER QUALITY METER 87REF RESTRICTED EARTH FAULT RELAY SURGE ARRESTER AUTOMATIC VOLTAGE REGULATOR DV DIGITAL VOLT METER REFERENCE DRAWINGS DRAWING TITLE DRAWING NO. DRAWING CONTROL SHEET CT-926693 SCOPE OF WORK AND TECHNICAL SPECIFICATIONS PTS-24CM1046 REV. DATE BY CHKD. CERT. APPD. Z DESCRIPTION DRAWING COMPLETION CERTIFICATE (DCC): DRAWN BY AHO CHECKED BY AMS/KIH SCALE: NONE DATE STARTED 2024-07-02 DATE COMPLETED 2024-07-02 OPR'G. DEPT. _____ ENG. DEPT. ____ THIS DRAWING IS NOT TO BE USED FOR CERTIFIED CONSTRUCTION OR FOR ORDERING MATERIAL UNTIL CERTIFIED AND DATED BY _____ DATE____ ONE LINE DIAGRAM TR67-DYN1-132 SAUDI ARABIA SHEET NO. REV. NO. INDEX PLANT NO.

NG-A (2012/01)

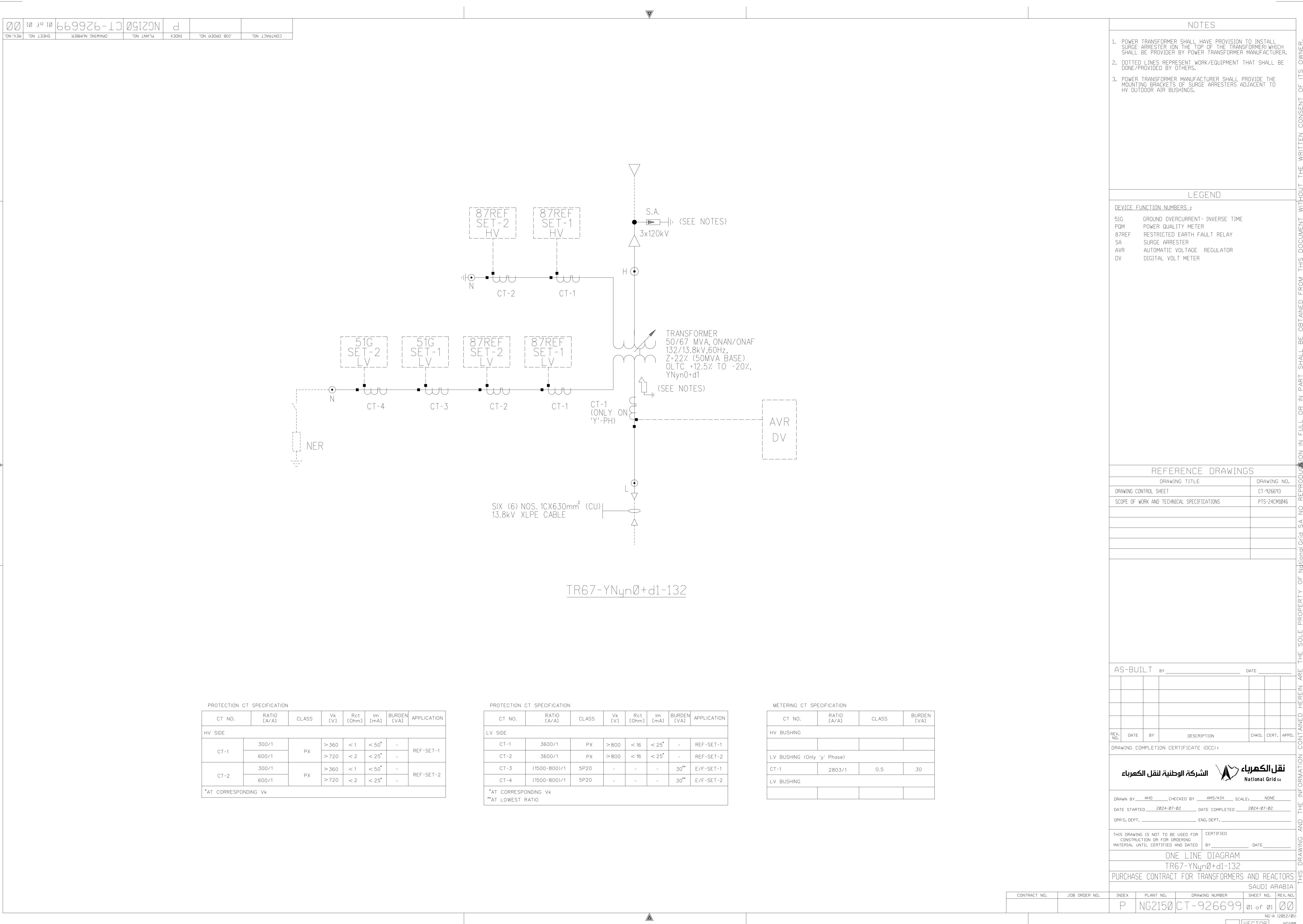
VECTOR NGA00

CONTRACT NO.

JOB ORDER NO.



NG-A (2012/01)
VECTOR NGA01



VECTOR NGAØØ

APPENDIX-2 MATERIAL DATA SCHEDULES



6.0 DATA SCHEDULE

TERMINAL BLOCKS

SEC	Enquiry No.		Date:	
No.	Purchase Order ontract No.		Date:	
SEC	PTS No./Project Title with J.O. No.	Refer To Main SOW	/TS	
	ERENCE FION NO. DESCRIPTION	'A'	'B'	'C'
4.0	DESIGN AND CONSTRUCTION RE	<u>QUIREMENTS</u>		
4.1	Terminal Block Make Type/Model No. Catalogue Enclosed Comparative Tracking Index (CTI) Creepage distance (mm) Material group per IEC 60947-1 Insulation material Pollution Degree	* Yes ≥600 * I Polyamide 6 3 or above		

- A'- SEC SPECIFIED DATA/PARAMETER.
- 'B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.
- 'C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.
- (*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/ VENDOR/CONTRACTOR IN COLUMN 'B'.

6.0 DATA SCHEDULE

TERMINAL BLOCKS

	ERENCE <u>TION NO.</u>	DESCRIPTION	'A'	'B'	'C'
4.3	Rated insulation vo	•	*		
	Impulse withstand	voltage	*		
	Rated current		*		
	Rated short time w	ithstand current	*		
	Cross sectional are	a	*	_	
	Jumper bars size/ra	ating	*		
	Sliding link rating		*		
	End section/stop si	ze/rating	*		
4.5	Terminal Block Ty	C	Screw/Spring loaded/Plug-in		
	CT Terminal Block shorting terminal w	—Disconnecting CT ith ground link	*		
	VT Circuits Termin	•	Sliding Link		
	Other types of Terr	ninal Block	*		
	Tightening torque		*		
	Degree of protection	on	IP2x		
	Test sockets size/ra	ating	*		
	Shot circuit plugs s	_	*		
	Number of connect	tions	1/2		
	Number of levels		1		
	Mounting on DIN	rail acc. to IEC 60715	*		



DATA SCHEDULE 6.0

		TERMINAL BLOCKS	S	
A.	ADDITIONAL TECHNIC SEC:	CAL INFORMATION OR FE	ATURES TO BE FURNISHE	D BY
В.	ADDITIONAL SUPPLE BIDDER/VENDOR/SUPP	EMENTARY DATA OR PLIER/CONTRACTOR:	FEATURES PROPOSED	BY
В.	OTHER PARTICULARS CONTRACTOR:	TO BE FILLED UP BY BIDE	DER/VENDOR/SUPPLIER/	
Name	e of the Company	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor	
	cion and address			
autho	sentative			
	ial Seal/Stamp Company & Date			



National Grid SA Enquiry No.			Date:		
National Grid SA Purchase Order No. or Contract No			Date:		
National Grid SA PTS No./P with J.O. No.	roject Title				
REFERENCE SECTION NO. DI	<u>ESCRIPTION</u>	'A'	<u>'B'</u>	'C'	
SYSTEM DATA					
Nominal System Volt (11kV, 13.8kV, 33kV 110kV, 115kV, 132k	, 34.5kV, 69kV,)			
		*			
System Fault Current					
Rated System Voltage	e (kA)	*	-		
Maximum Duration of	of Ground Fault (ms)	*			
System Neutral Grou Of Installation (Effec Grounded)	_				

- 'A'- NATIONAL GRID SA SPECIFIED DATA/PARAMETER.
- 'B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.
- 'C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.
- (*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/ VENDOR/CONTRACTOR IN COLUMN 'B'.



	RENCE <u>ION NO.</u>	<u>DESCRIPTION</u>	'A'	<u>'B'</u>	'C'
Syster	m Component(s)	to be protected			
Sur	mission Line ge Impedance (on ngth (kM)	hms)	*		
Underground Cable Capacitance (µF/kM) Length (kM)		* *			
	itor Banks pacitance (MVAI	₹)			
		s, Reactors, GIS etc.,	*		
3.0	APPLICABLE	INDUSTRY STANDARDS	*		
4.0	DESIGN AND	CONSTRUCTION REQUIRE	EMENTS		
4.1	General Type Model Designa Location (Indoo		*		
4.2	Performance Cl	naracteristics and Ratings			
	Rated Voltage (Continuous ope Arrester Class/(erating voltage (Uc)	*		
	Lightning in	stand for Housing npulse withstand voltage, us waveform (kV _{peak})	*		
	Power frequence Outdoor/Dry fo	y withstand voltage (Wet for r indoor)	*		
	With 250/2500	llse withstand voltage µs waveform (for arrester ge 200kV and above (kV _{peak})	*		



REFE	ERENCE				
SECT	TION NO.	<u>DESCRIPTION</u>	'A'	'B'	'C'
4.2	Contd.				
		ge Current (Lightning Impulse			
Cla	ssifying Curre	ent) with 8/20 μs waveform (kA)	*		
		nt impulse Capability with 4/10µs	ata		
	Waveform	(kA _{peak})	*		
	Maximum	Lightning Impulse Residual Voltage	<u>.</u>		
		us waveform (kV _{peak}) at a Discharge			
) current of:	,		
	- 5kA) current or.	*		
	- 10kA		*		
	- 20kA		*		
			*		
	- 40kA		*		
	N/	S			
		Switching Surge Residual Voltage			
	(KV_{peak}) at 1 - $0.5kA$	Discharge Current of	*		
			*		
	- 1kA				
	- 2kA		*		
	Maximana	Steam Cumunt /Frant of Ways			
		Steep Current /Front-of-Wave oltage Based on 1/2 or 0.5 µs			
		as Applicable (kV _{peak})			
	- 10kA	as Applicable (K v peak)	*		
	- IUKA				
	- 20kA		*		
	- ZUKA				
	Temporery	over voltage capability (kV _{rms})			
		rer shall submit curve for TOV for	the		
	`	duration with and without Prior duty			
	- 0.1seco	•	*		
	- 1 secon		*		
	- 10 secon		*		
			*		
	100secc	ona	ጥ		
	Movimum	D I V (uv)	*		
	Maximum l	κ.1. ν (μν)	•		



	ION NO. DESCRIPTION	'A'	'B'	'C'
4.2	Contd.			
	Maximum External Insulation Levels Power Frequency Dry Withstand Voltage (kVrms)	*		
	Power frequency wet withstand voltage (kVrms)	*		
	Lightning impulse withstand voltage (kVpeak)	*		
	Switching impulse withstand voltage (kVpeak)	*		
Le	akage current through Arrester at COV (Uc) (mA)	*		
Th	aximum Energy Absorption Capability per lermal Energy Rating (Wth) kJ/kV of arrester rated Volatge (<i>U</i> r)			
Re	epetitive Charge Transfer rating (Qrs(C))			
M	aximum resistive current acceptable	*		
4.3	Construction			
	Pressure Relief Capability (rms symmetrical)			
	High Current Short duration			
	Low current, long duration (A)	600		
	Arrester Housing Porcelain/I	**		
	Creepage Distance (mm)	*		·
	Bending Failing Load (kN)	*		
	Cantilever Strength min (kN)	*		
	Torsional Strength (kN)	*		
	Compression Strength (kNm)	*		
	No. of Stacks in each unit	*		
	Height (mm)	*		



	ERENCE				
	TION NO.	<u>DESCRIPTION</u>	'A'	<u>'B'</u>	<u>'C'</u>
4.3	Contd.				
Intom	aal Duagguna Da	avinad to Onamata			
mieri		quired to Operate			
		ef device as a Percent of	*		
	Pressure requ	uired to Burst Porcelain (%)	*		
	Mounting arr	rangement			
	Mode of m	ounting (self-supporting/bracket			
	Bracket suj	oporting)	*		
		diameter (mm)	*		
	No. of hole		*		
	Size of Bol		*		
	5120 01 20.	(11111)			
	Accessories				
	Scale range of	of leakage ammeter (mA)	*		
	Diameter of	the grading ring if applicable (mm	*		
	Material of g	rading ring if applicable	*		
	Terminals				
	Type		Pad		
	Size (mm)	-	*		
	Material (A	1 or CII)	*		
	Material (F	and co)			
	Grounding				
	Size (mm)		*		
	Material		*		
	<u>MISCELLANI</u>	<u>EOUS</u>			
	Minimum alaa	nanca hatayaan liyya nanta			
		rance between live parts	*		
	and earth parts	(mm)	ጥ		
	Minimum Perr	nissible Center to Center			
	Distance between	een Arresters (mm)	*		
		of arrester (mm)	*		
	Weight of arre	ster (kg)	*		



A.	ADDITIONAL TECHNICAL IN NATIONAL GRID, SA:	NFORMATION OR FEATURI	ES TO BE FURNISHED BY
В.	ADDITIONAL SUPPLEMEN' BIDDER/VENDOR/SUPPLIER/		TURES PROPOSED BY
C.	OTHER PARTICULARS TO CONTRACTOR:	BE FILLED UP BY BII	ODER/VENDOR/SUPPLIER/
	e of the Company ion and address	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
autho	sentative		
	ial Seal/Stamp Company &		



National Grid Saudi Arabia Enquiry No. National Grid, Saudi Arabia, Purchase Order No. or Contract No			Date:	
			Date:	
	nal Grid, Saudi Arabia PTS Project Title with J.O. No.			
	ERENCE FION NO. DESCRIPTION	'A'	'B'	'C'
	Power Transformer Model No./Type No.	*		
	Type of System Grounding(Solidly grounded, resistance grounded, other) HV			
	LV TV (if applicable) Common Neutral (Auto Transformer)			
3.0	Applicable Industry Standards	*		
4.0 4.1	DESIGN AND CONSTRUCTION REQUIR Design Ambient Temperature (°C)	LEMENTS *		
	Number of Windings			
	Type of Cooling			
	Vector Group Designation			

- A'- SEC SPECIFIED DATA/PARAMETER.
- 'B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.
- 'C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.
- (*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/ VENDOR/CONTRACTOR IN COLUMN 'B'.



	RENCE <u>ION NO.</u>	DESCRIPTION	'A'	<u>'B'</u>	'C'
4.3.1	Natural Cooli HV/LV/T		/ /	/ /	/ /
	1st Stage Fore	ced Cooling			
	2nd Stage For HV/LV/T	V (MVA)	/ /	/ /	/ /
	Rated Voltage HV/LV/T	e Transformation Ratio V (kV)	/ /	/	/
	Temperature Temperature TMSS-01	Rise Based on Ambient Conditions Specified in 01-			
	Winding °C		*		
	Oil °C		*		
	Winding max Temperature	ximum (hot spot) (°C)	*		
	Design X/R 1	ratio			
	HV		*		
	LV		*		
	TV		*		
	base and re	Voltage natural cooling power eference temp. of 75°C (%) er shall indicate the value with lerance)			
	1. At Princi	pal Tap (Guaranteed values)			
		if applicable)	*		
		if applicable)	*		
		me Plus Tap			
	HV - LV		*		
	`	if applicable)	*		
	LV-TV (i	if applicable)	*		



REFERENCE		IDI	IGI
SECTION NO. DESCRIPTION	'A'	'B'	<u>'C'</u>
4.3.1 (continued)			
3. At Extreme Minus Tap	*		
HV - LV	*		
HV-TV (if applicable)	*		
LV-TV (if applicable)	~		
Zero-sequence impedance on natural cooling power base and reference temp. of 75°C (%)(Manufacturer shall indicate the value with applicable tolerance)			
 At Principal Tap 			
HV - LV	*		
HV-TV (if applicable)	*		
LV-TV (if applicable)	*		
2. At Extreme Plus Tap			
HV - LV	*		
HV-TV (if applicable)	*		
LV-TV (if applicable)	*		
3. At Extreme Minus Tap			
HV - LV	*		
HV-TV (if applicable)	*		
LV-TV (if applicable)	*		
H' had Darian Orandina Walter			
Highest Design Operating Voltage			
for the tappings	105		
continuous operation (%)	105	<u> </u>	
emergency operation (%)	110		
Mayimana Dagion Elay Donaity			
Maximum Design Flux Density at rated voltage (Tesla)	*		
at 110% rated voltage (Tesla)	*		
Saturation Voltage (%U _N)	*		
Saturation Voltage (700N)			
Current density at rated output			
Primary winding (Amp/mm ²)	*		
Secondary winding (Amp/mm ²)	*		
Tertiary winding (Amp/mm ²)	*		
Torumy whiching (Ampilinin)			
No-load current when excited from LV side			
as % of full load current	*		
33 / 0 OI IMILIONG COLLOUIT			



DEFEDENCE	RATED ADC	VE 2.5 WIVA		
REFERENCE	DESCRIPTION	1.4.1	'B'	'C'
SECTION NO.	<u>DESCRIPTION</u>	'A'	В	
4.3.1 (continued)	valtaga (Cuamenta ed value)	*		
	voltage (Guaranteed value)	*		
	voltage			
110%	voltage	*		
No load a	current harmonics			
	% and 110% rated voltage (%)			
	rmonics	*/*	/	/
	rmonics	*/*		
	rmonics	*/*	/	/
	rmonics	*/*		
	rmonics	*/*		
	monics	*/*		
	rmonics	*/*		
	rmonics	*/*		
7		,		<u> </u>
Basic Imp	ulse Withstand Voltage (BIL)			
HV wi	nding (kV _{peak})	*		
	nding (kV _{peak})	*		
	utral end (kV _{peak})	*		
	itral end (kV _{peak})	*		
	on neutral for auto			
	nsformer winding (kV _{peak})	*		
	y winding (kV _{peak})	*		
	y neutral end (kV _{peak})	*		
(if app	olicable)			
C:4-1-:	. L			
	Impulse Withstand Voltage applicable (kV _{peak})	*		
(BSL) II a	applicable (k v peak)			
Separate S	Source Power Frequency			
	and Voltage			
HV wi	nding (kV _{rms})	*		
	nding (kV _{rms})	*		
	utral end (kV_{rms})	*		
	ıtral end (kV _{rms})	*		
	on neutral for auto			
transfo	rmer winding (kV _{rms})	*		
Tertiar	y Winding (kV _{rms})	*		



REFE	RENCE			
·	ON NO. <u>DESCRIPTION</u>	'A'	'B'	'C'
4.3.1 ($\frac{\text{continued})}{\text{Tertiary neutral end } (kV_{rms})}$ (if applicable)	*		
4.3.3	Requirement for parallel operation	Yes/No		
4.3.4	Guaranteed No-Load Losses at rated frequency (kW)			
	- at 100% rated voltage	*		_
	No-Load Losses at rated frequency	·		
	- at 105% rated voltage	*		=
	- at 110% rated voltage	*		
	Guaranteed Load Losses at 75°C at principal tappings (kW) for Natural Cooling Rating (ONAN)			
	- HV to LV	*		
	Guaranteed Load Losses at 75°C at principal tappings (kW) for Natural Cooling Rating (ONAN)			
	- LV to TV at TV rated power	*		
	- HV to TV at TV rated power	*		
	Guaranteed Load Losses at 75°C at principal tappings (kW) for Stage 1 Cooling Rating			
	- HV to LV	*		
	- LV to TV at TV rated power	*	<u></u> .	
	- HV to TV at TV rated power	*		
	Guaranteed Load Losses at 75°C at principal tappings (kW) for Stage 2 Cooling Rating - HV to LV	*		
	- LV to TV at TV rated power	*		
	- HV to TV at TV rated power	*		

REFERENCE



7.0 DATA SCHEDULE

<u>SECTI</u> NO.	<u>DESCRIPTION</u>	'A'	'B'	'C'
	continued)		· -	
	1 - 1 1 4 75°C - 4 4i laring			
	Load Losses at 75°C at tappings having highest losses (kW)			
	- Tap Position No.	*		
	- HV to LV	*		
	- HV to TV	*		
	T-4-1 1 ofili-ni n and f			
	Total losses of auxiliaries, pumps and fans in service at full load (kW)			
	at Stage 1 cooling	*		
	at Stage 2 cooling	*		
	at stage 2 coomig			
4.3.6	Maximum Symmetrical short			
	circuit current for which windings			
	are designed to thermally withstand			
	Duration (seconds)	*		
	HV winding (kA)	*		
	LV winding (kA)	*		
	TV winding (kA)	*		
	Maximum Asymmetrical short			
	circuit current for which the windings			
	are mechanically designed			
		*		
	HV winding (kA _{peak})			
	LV winding (kA _{peak})	*		
	TV winding (kA _{peak})	Φ		
	Thermal and mechanical damage curve			
	per IEEE C57.109 enclosed	*	Yes/No	
4.3.7	Temperature rise test to prove tertiary			
	winding rating required	Yes/No		
	Transferred overvoltage calculation for	Ψ.	X7 / N.T	
	tertiary winding enclosed	*	Yes/No	



	RENCE			
<u>SECTI</u>	ON NO. <u>DESCRIPTION</u>	<u>'A'</u>	<u>'B'</u>	<u>'C'</u>
4.3.9	Noise level at rated voltage and frequency			
	- at Natural Cooling (dB)			
	- at Stage 1 Cooling (dB)	*		
	- at Stage 2 Cooling (dB)	*		
4.4	Construction			
4.4.1	Type of tank construction			
	Tank Cover	Welded		
	Min. thickness of tank steel (mm)			
	- Sides	*		
	- Base	*		
	- Cover	*		
	Min. Thickness of radiator plates (mm)	*		
	Maximum Positive Withstand Pressure			
	of Tank and Radiators (kPa)	*		
	Minimum Vacuum Withstand (milli bar)	*		
4.4.3	Winding Insulation			
	HV Winding	*	Uniform/ Graded	
	LV Winding	*	Uniform/ Graded	
	TV Winding	Uniform	Graded	
	Winding Leakage Reactance (ohm)	*		
4.5	Tap Changer	On load		
	Manufacturer	*		
	Type	Oil/Vacuum		
	Type Designation	*		
	Tap Arrangment	*		
	(Linear, Reversing or Coarse/fine) Number of steps			
	Step Voltage (%)			
	Tapping Range (%)		·	
	Rated Through Current (A)	*		
	• ,	*		
	Short Circuit Current (kA)	747		



REFER		V L 2.5 WI V II		
	<u>DN NO.</u> <u>DESCRIPTION</u>	'A'	'B'	'C'
4.5 (co	ntinued)	*		
	Dynamic short circuit current (kA _{peak}) Location (In-tank type fitted inside	·		
	transformer main tank/outside transformer			
	main tank or External mounted type)	*		
	71 /			
	Voltage Class (kV _{rms})	*		
	$BIL (kV_{peak})$	*		
	Type of transition impedance (high			
	resistance)	*		
	Time of transfer from one step to another			
	- motor-operated (seconds)	*		
	- manually operated (Number of			
	revolution)	*		
	10,014,014			
	Oil filter unit for Oil type OLTC	*		
	on much dank for on type of the			
	Motor drive unit:			
	Туре	*		
	Power	*		
	Rated Voltage $(V_{ac})/(V_{dc})$		_	
	Number of phases		_	
	Control voltage $(V_{ac} \text{ or } V_{dc})$			
	Space heater (V _{ac})	230		
	Heater Wattage (W)	*		
	Provision of parallel operation along with			
	Supervisory Equipment	Yes/No		
		1 65/1 (6		
	Oil/Gas Surge Relay for OLTC			
	Manufacturer	*		
	Type Designation	*		
	Alarm Contact Current Rating at			
	$125 V_{dc}(A)$	*		

REFERENCE



7.0 DATA SCHEDULE

SECTION SECTION		'A'	'B'	'C'
4.5 (<u>co</u>	ntinued)			
	Pressure Relief Device (OLTC)			
	Manufacturer	*		
	Type Designation	*		
	Number of Pressure Relief Device(s)	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	2		
	Alarm Contact Current Rating at 125 V _{dc} (A)	*		
4.6.1	Oil Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Type of Liquid Sensing Element	*		
	Provision of maximum indicator	Yes/No		
	Adjustment Range of Alarm and Trip contacts (From_to_°C)	0-160°C		
	Adjustment Range of Forced cooling contacts (From_to_°C)	0-160°C		
	Contact Current Rating at 125 V _{dc} (A)	*		
	Number of contacts	4		
4.6.2	Winding Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Type of Liquid Sensing Element	*		
	Provision of maximum indicator	Yes/No		
	Adjustment Range of Alarm and	105/110		
	Trip contacts (From_to_°C)	0-160°C		
	Adjustment Range of Forced	0.16000		
	cooling contacts (From_to_°C)	0-160°C		
	Contact Current Rating at 125 V _{dc} (A)	*		
	Number of contacts	4		
4.6.3.c	No. of sensors			
	HV Winding			
	LV Winding			

REFERENCE



7.0 DATA SCHEDULE

SECTI NO.	ON DESCRIPTION	'A'	'B'	'C'
4.8	Buchholz Relay			
	Manufacturer	*		
	Type Designation	*		
	Alarm/Trip Contact Current			
	Rating at 125 $V_{dc}(A)$	*		
4.9	Pressure Relief Device (Main Tank)			
	Manufacturer	*		
	Type Designation	*		
	Pressure Range for Operation	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	2		
	Alarm Contact Current Rating at 125		_	
	$V_{dc}(A)$	*		
	Rapid Pressure Rise Relay	Yes/No		
4.10	Bushings High Voltage Bushings			
	Manufacturer & Country	*		
	Type designation	*		
	Material	*		
	Location (top, side, others)			
	Terminal take off angle (vertical, horizontal, angle)			
	Number			
	Rated Voltage (kV)			
	Rated Maximum Voltage (kV)			
	Rated current (A)	*		
	$BIL (kV_{peak})$	*		
	Switching Impulse Withstand Voltage, if applicable (kV_{peak})	*		
	Power Frequency Dry/Wet Withstand Voltage (kV _{rms})	*		
	Creepage distance (mm)	*		
	Cantilever strength (kN)	*		



DEFEDENCE	KATEDA	DOVE 2.5 WIVA		
REFERENCE	DECORPTION	1.4.1	IDI	ICI
SECTION NO	-	<u>'A'</u>	<u>'B'</u>	<u>'C'</u>
4.10 (continue				
IVI	ounting details			
	Hole circle diameter of the			
	flange (mm)	*		
	Number of bolts	*		
	Hole diameter (mm)	*		
T	erminal			
	Туре	*		
	Size	*		
	No. of holes, if applicable	*		
	, 11			
Low	Voltage Bushing			
M	anufacturer & Country	*		
	ype designation	*		
	Iaterial	*		
L	ocation (top, side, others)			
	erminal take off angle			
	ertical, horizontal, angle)			
	umber	-	-	-
	ated Voltage (kV)			
	ated Maximum Voltage (kV)			
	ated current (A)	*		
	$IL (kV_{peak})$	*	-	-
	ower Frequency Dry/Wet			
	Withstand Voltage (kV _{rms})	*		
\mathbf{C}_1	reepage distance (mm)	*	-	-
	antilever strength (kN)	*		
	ounting Details			
141	Hole circle diameter of the			
	flange (mm)	*		
	Number of bolts	*	-	-
		*		
	Hole circle diameter (mm)	*		
Te	erminal			
	Type	*		
	Size	*		
	No. of holes, if applicable	*		
	·			



REFERENCE			
SECTION DESCRIPTION	'A'	'B'	'C'
<u>NU.</u>			
4.10 (continued)			
HV Neutral Bushing			
Manufacturer & Country	*		
Type designation	*		
Material	*	· · · · · · · · · · · · · · · · · · ·	
Location (top, side, others)			
Terminal take off angle			
(vertical, horizontal, angle)			
Rated Voltage (kV)	*		
Rated Maximum Voltage (kV)	*		
Rated current (A)	*		
BIL (kV _{peak})	*		
Power Frequency Dry/Wet			
Withstand Voltage (kV _{rms})	*		
Creepage distance (mm)	*		
Cantilever strength (kN)	*		
Mounting details			
Hole circle diameter of the			
flange (mm)	*		
Number of bolts	*		
Hole circle diameter (mm)	*		
Terminal			-
Туре	*		
Size	*		
No. of holes, if applicable	*		
TI TI			
LV Neutral Bushing/Common Neutral Bushing for Auto Transformer			
Manufacturer	*		
Type designation	*		
Material	*		
	·		
Location (top, side, others)			
Terminal take off angle			
(vertical, horizontal, angle) Rated Voltage (kV)	*		
Naicu voitage (KV)	•		



SECTION NO. DESCRIPTION	'A'	'B'	101
			'C'
4.10 (<u>continued)</u> Rated Maximum Voltage (kV)	*		
Rated current (A)	*		
BIL (kV _{peak})	*		
Power Frequency Dry/Wet			
Withstand Voltage (kV _{rms})	*		
Creepage distance (mm)	*		
Cantilever strength (kN)	*		
Mounting details			
Hole circle diameter of the			
flange (mm)	*		
Number of bolts	*		
Hole circle diameter (mm)	*		
Terminal			
Type	*		
Size	*		
No. of holes, if applicable	*		
Tertiary Bushing			-
Manufacturer & Country	*		-
Type designation	*		
Material	*		
Location (top, side, others)			
Terminal take off angle			
(vertical, horizontal, angle)			
Rated Voltage (kV)			
Rated Maximum Voltage (kV)	*		
Rated current (A)	*		
$BIL (kV_{peak})$	*		
Power Frequency Dry/Wet			
Withstand Voltage (kV _{rms})	*		
Creepage distance (mm)	*		
Cantilever strength (kN)	*		
Mounting details			
Hole circle diameter of the			
flange (mm)	*		
Number of bolts	*		
Hole circle diameter (mm)	*		

REFERENCE



7.0 DATA SCHEDULE

SECTIO	N NO. <u>DESCRIPTION</u>	'A'	'B'	'C'
4.10 (<u>cor</u>	<u>-tinued)</u>			
	Terminal			
	Туре	*		
	Size	*		
	No. of holes, if applicable	*		
4.13 & 4.14	Cooling Equipment			
	Fans	*		
	Manufacturer & Country			
	Number of cooling fans (main/spare)	*		
	Number of cooling fan groups	*		
	Power rating of each fan	*		
	Supply Voltage (V _{ac})	*		
	Number of phases	*		
	Number of wires	*		
	Total fan consumption at full load (kW)	*		
	Degree of protection for fan blades	*		
	Pumps			
	Manufacturer & Country			
	Number of oil pumps	*		
	Type designation	*		
	Motor rating (kW/HP)	*		
	Supply Voltage (V _{ac})	*		
	Number of phases	*		
	Number of wires	*		
	Degree of protection for motor pumps	*		
	Total Power Consumption at			
	full load (kW)	*		
4.15	Conservator			
	Oil Level Indicator for the Main Tank			
	Manufacturer & Country	*		
	Type Designation	*		
	Alarm Contact Current Rating at			
	$125 \mathrm{V}_{\mathrm{dc}} (\mathrm{A})$	*		



	KATED ADO	V L 2.3 IVI V A		
	ON NO. <u>DESCRIPTION</u>	'A'	'B'	'C'
4.15.2	(<u>continued</u>)			
	Oil level indicator for OLTC			
	Manufacturer & Country Type Designation	*		
	Alarm Contact Current rating at $125 V_{dc}(A)$	*		
	Conservator Expansion Device Material Manufacturer & Country	*		
4.17	Drain, Filter and Sampling Valves (attach drawing for each type of valve) Manufacturer & Country for each valve			
	Type & Size of Oil Drain Valve (mm)	50		
	Type and Size of Filtration Valve (mm)	50		
	Size of Oil Sampling Valve/s (mm)	20		
	Type & Size of Radiator Valves (mm)	*		
4.19	Transformer Moving Facilities			
	Transformer Base Type	Skid/ Wheels		
	Wheel Details Wheels Center to Center Distance (1100/2100/3100mm)	*		
4.20	Ladder	Yes/No		
4.22	Transformer Terminal Markings	clause 4.20/ IEC 60616		
4.23	Transformer Mineral Oil (Manufacturer shall fill up column "B' of 54-TMSS-01 Data Schedule)	*		



High Voltage Bushing Current Transformers Manufacturer & Country Type Designation No. of CTs per phase Continuous Thermal Current Rating Factor Metering CT Protection CT Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	'C'
Manufacturer & Country Type Designation No. of CTs per phase Continuous Thermal Current Rating Factor Metering CT Protection CT Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	
Type Designation No. of CTs per phase Continuous Thermal Current Rating Factor Metering CT Protection CT Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	
No. of CTs per phase Continuous Thermal Current Rating Factor Metering CT Protection CT Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	
Continuous Thermal Current Rating Factor Metering CT Protection CT Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	
Protection CT Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	
Protection CT Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	_
Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	_
Multi Ratio CTs (MRCT) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration	
Single Ratio CTs Rated Short Time Withstand Current Thermal I _{th} (kA) * Dynamic (kA _{peak}) 2.6xI _{th} Short Time Thermal Current duration	
Rated Short Time Withstand Current Thermal I_{th} (kA) * Dynamic (kA _{peak}) 2.6x I_{th} Short Time Thermal Current duration	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	<u>-</u> , -
Dynamic (kA _{peak}) Short Time Thermal Current duration	
Short Time Thermal Current duration	
	_
(sec.)	
Rated primary short circuit current I _{PSC} (kA) *	
Temperature Rise (°C) *	
Core No. 1 /2 /3 1 /2 /3	
Purpose (Relaying or Metering)	_
Type of Protection	
(Back-up/differential/Distance/REF etc.) / / /	_
Current Ratio at specified tap /// // //	<u> </u>
Accuracy Class /// //	
Burden (VA)/Resistive Burden-R _b (ohms) / / /	
Secondary Winding Resistance at 20°C, R _{ct} (ohms) / / /	



REFERENCE			
SECTION DESCRIPTION	'A'	'B'	'C'
<u>NO.</u>			
4.24 (<u>continued</u>)			
For class TPS CTs per IEC			
Rated symmetrical short circuit current			
factor -K _{SSC}	*/ * /*	//	
Dimensioning parameter -K	*/ * /*	//	
Excitation limiting secondary voltage			
-U _{al} (Volts)*	*/ * /*	//	
Accuracy limiting secondary exciting			
$current - I_{al} (mA)$	*/ * /*	//	
Secondary excitation current-I _{mag}			
at half excitation limiting secondary			
voltage (mA)	*/ * /*	//	
For class C or K CTs per IEEE / Class P CT			
per IEC			
Magnetizing current -I _{mag} (mA)	*/ * /*	/	
Knee point voltage -V _k (Volts)/			
/Secondary limiting e.m.f	*/ * /*	/	
Low Voltage Bushing Current Transformers			
Manufacturer	*		
Type Designation	*		
No. of CTs per phase			
No. of C1s per phase			
·····			
Continuous Thermal Current Rating Factor Metering CT			
Protection CT			
Multi Ratio CTs (MRCT)			
Single Ratio CTs			
Rated Short Time Withstand Current			
Thermal I _{th} (kA)	*		
` '	2.6.1		
Dynamic (kA _{peak})	$2.6 \mathrm{xI}_{\mathrm{th}}$		
Short Time Thermal Current duration (sec.)			
Rated primary short circuit current			
$I_{PSC}(kA)$	*		
Temperature Rise (°C)	*		



REFERENCE			
SECTION DESCRIPTION	'A'	'B'	'C'
4.24 (<u>continued</u>)			
Core No.	1 /2 /3	1 /2 /3	
Purpose (Relaying or Metering)		/ /	
Type of Protection			
(Back-up/differential/Distance/REF etc.)	/ /	/ /	
Current Ratio at specified tap		/ /	
Accuracy Class			
Burden (VA)/Resistive Burden-R _b (ohms)			
Secondary Winding Resistance at 20°C,			
R_{ct} (ohms)	/		
E-v-lass TDC CT- var IEC			
For class TPS CTs per IEC Rated symmetrical short circuit current			
factor -K _{SSC}	*/ * /*	/ /	
Dimensioning parameter -K	*/ * /*		
Excitation limiting secondary voltage		·	
-U _{al} (Volts)*	*/ * /*	/_/	
Accuracy limiting secondary exciting	ate (ate (ate	, ,	
current – I _{al} (mA)	*/ * /*		
Secondary excitation current-I _{mag} at half excitation limiting secondary			
voltage (mA)	*/ * /*	/ /	
For class C or K CTs per IEEE / Class P CT	<u>[</u>		
<u>per IEC</u> Magnetizing current -I _{mag} (mA)	*/ * /*	/ /	
Knee point voltage $-V_k$ (Volts)/	/ /		
/Secondary limiting e.m.f	*/ * /*		
High Voltage Neutral Bushing Current			
Transformers			
Manufacturer	*		
Manufacturer Type Designation	*		
Type Designation	•		
No. of CTs			
Continuous Thermal Current Rating Factor Protection CT			
Multi Ratio CTs (MRCT)			



NO. DESCRIPTION A 'B' C 4.24 (continued) Single Ratio CTS Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration (sec.) Rated primary short circuit current I _{PSC} (kA) Temperature Rise (°C) Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-R _b (ohms) Secondary Winding Resistance at 20°C, R _{ct} (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -K _{SSC} Dimensioning parameter -K Excitation limiting secondary voltage -U _{al} (Volts)* Accuracy limiting secondary exciting current -I _{al} (mA) Secondary excitation current-I _{mag} at half excitation limiting secondary voltage (mA) For class C or K CTs per IEEE / Class P CT	REFERENCE			
A.24 (continued) Single Ratio CTs Rated Short Time Withstand Current Thermal I _{In} (kA)	SECTION DESCRIPTION	'A'	'B'	'C'
Single Ratio CTs Rated Short Time Withstand Current Thermal I _{ln} (kA)	<u>NO.</u>			
Rated Short Time Withstand Current Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration (sec.) Rated primary short circuit current I _{PSC} (kA) Temperature Rise (°C) Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-R _b (ohms) Secondary Winding Resistance at 20°C, R _{ct} (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -K _{SSC} Dimensioning parameter -K Excitation limiting secondary voltage -U _{al} (Volts*) Accuracy limiting secondary exciting current - I _{al} (mA) Secondary excitation limiting secondary voltage (mA) For class C or K CTs per IEEE / Class P CT				
Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration (sec.) Rated primary short circuit current I _{PSC} (kA) Temperature Rise (°C) * Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-R _b (ohms) Secondary Winding Resistance at 20°C, R _{et} (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -K _{SSC} Dimensioning parameter -K Excitation limiting secondary voltage -U _{al} (Volts)* Accuracy limiting secondary exciting current - I _{al} (mA) Secondary excitation current-I _{mag} at half excitation limiting secondary voltage (mA) */* For class C or K CTs per IEEE / Class P CT	Shigle Ratio C18			
Thermal I _{th} (kA) Dynamic (kA _{peak}) Short Time Thermal Current duration (sec.) Rated primary short circuit current I _{PSC} (kA) Temperature Rise (°C) * Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-R _b (ohms) Secondary Winding Resistance at 20°C, R _{et} (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -K _{SSC} Dimensioning parameter -K Excitation limiting secondary voltage -U _{al} (Volts)* Accuracy limiting secondary exciting current - I _{al} (mA) Secondary excitation current-I _{mag} at half excitation limiting secondary voltage (mA) */* For class C or K CTs per IEEE / Class P CT	Poted Short Time Withstand Current			
Short Time Thermal Current duration (sec.) Rated primary short circuit current I_PSC (kA) Temperature Rise (°C) Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-Rb (ohms) Secondary Winding Resistance at 20°C, Rct (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -KSSC Dimensioning parameter -K Excitation limiting secondary voltage -Ual (Volts)* Accuracy limiting secondary exciting current - Ial (mA) Secondary excitation current-Imag at half excitation limiting secondary voltage (mA) */* For class C or K CTs per IEEE / Class P CT		*		
Short Time Thermal Current duration (sec.) Rated primary short circuit current I _{PSC} (kA) Temperature Rise (°C) Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-Rb (ohms) Secondary Winding Resistance at 20°C, Ret (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -K _{SSC} Dimensioning parameter -K Excitation limiting secondary voltage -U _{al} (Volts)* Accuracy limiting secondary exciting current - I _{al} (mA) Secondary excitation current-I _{mag} at half excitation limiting secondary voltage (mA) */* For class C or K CTs per IEEE / Class P CT				
Rated primary short circuit current I _{PSC} (kA) Temperature Rise (°C) * Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-R _b (ohms) Secondary Winding Resistance at 20°C, R _{ct} (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -K _{SSC} Dimensioning parameter -K Excitation limiting secondary voltage -U _{al} (Volts)* Accuracy limiting secondary exciting current - I _{al} (mA) Secondary excitation current-I _{mag} at half excitation limiting secondary voltage (mA) */* For class C or K CTs per IEEE / Class P CT	Dynamic (KA _{peak})	$\frac{2.0XI_{\text{th}}}{}$		
Rated primary short circuit current I _{PSC} (kA) Temperature Rise (°C) * Core No. Type of Protection (differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-R _b (ohms) Secondary Winding Resistance at 20°C, R _{ct} (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -K _{SSC} Dimensioning parameter -K Excitation limiting secondary voltage -U _{al} (Volts)* Accuracy limiting secondary exciting current - I _{al} (mA) Secondary excitation current-I _{mag} at half excitation limiting secondary voltage (mA) */* For class C or K CTs per IEEE / Class P CT				
Temperature Rise (°C) Core No.				
Core No. 1 / 2 1 / 2 Type of Protection (differential/ REF etc.) / / / / / / / / / / / / / / / / / / /	_ · · · · ·	*		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Temperature Rise (°C)	*		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Com No	1 / 2	1 / 2	
(differential/ REF etc.) Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-Rb (ohms) Secondary Winding Resistance at 20°C, Rct (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -Kssc		1 / 2	1 / 2	
Current Ratio at specified tap Accuracy Class Burden (VA)/Resistive Burden-Rb (ohms) Secondary Winding Resistance at 20°C, Rct (ohms) For class TPS CTs per IEC Rated symmetrical short circuit current factor -Kssc		/	/	
Accuracy Class $/$ $/$ $/$ $/$ Secondary Winding Resistance at 20° C, R_{ct} (ohms) $/$ $/$ $/$ $/$ $/$ $/$ $/$ $/$ $/$ $/$,			
Burden (VA)/Resistive Burden- R_b (ohms) / Secondary Winding Resistance at 20°C, R_{ct} (ohms) / / / / / / / / / / / / / / / / / / /	Current Ratio at specified tap	/	/	
Burden (VA)/Resistive Burden- R_b (ohms) / Secondary Winding Resistance at 20°C, R_{ct} (ohms) / / / / / / / / / / / / / / / / / / /	Accuracy Class			
Secondary Winding Resistance at 20°C , R_{ct} (ohms) / / / / / / / / / / / / / / / / / / /	· ·			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		·	·	
Rated symmetrical short circuit current factor $-K_{SSC}$	· · ·	/	/	
Rated symmetrical short circuit current factor $-K_{SSC}$ */* / Dimensioning parameter $-K$ */* / Excitation limiting secondary voltage $-U_{al}$ (Volts)* */* / Accuracy limiting secondary exciting current $-I_{al}$ (mA) */* / Secondary excitation current- I_{mag} at half excitation limiting secondary voltage (mA) */* / For class C or K CTs per IEEE / Class P CT	For class TPS CTs per IEC			
factor - K_{SSC}	-			
Dimensioning parameter -K	•	*/*	/	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		·		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	~ ~			
Accuracy limiting secondary exciting current – I_{al} (mA) */* / Secondary excitation current- I_{mag} at half excitation limiting secondary voltage (mA) */* / For class C or K CTs per IEEE / Class P CT		*/*	/	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	` /			
at half excitation limiting secondary voltage (mA) */* // For class C or K CTs per IEEE / Class P CT		*/*	/	
voltage (mA) */* /	Secondary excitation current-I _{mag}			
For class C or K CTs per IEEE / Class P CT				
	voltage (mA)	*/*		
	For class C or K CTs per IEEE / Class D CT			
ner ieu.	per IEC			
Magnetizing current -I _{mag} (mA) */* /		*/*	/	



REFERENCE			
SECTION NO. DESCRIPTION	'A'	<u>'B'</u>	'C'
4.24 (continued)			
Knee point voltage $-V_k$ (Volts)/	ata (ata	,	
/Secondary limiting e.m.f	*/*		
I V-14 N			
Low Voltage Neutral/Common Neutral Bushing Current Transformers			
for Auto Transformer			
for runo fransionner			
Manufacturer	*		
Type Designation	*		
No. of CTs			
Continuous Thermal Current Rating Factor			
Protection CT			
Multi Ratio CTs (MRCT)			
Single Ratio CTs			
Rated Short Time Withstand Current			
Thermal I _{th} (kA)	*		
Dynamic (kA _{peak})	$2.6xI_{th}$		
Short Time Thermal Current duration			
(sec.)			
Rated primary short circuit current	*		
I _{PSC} (kA)	*		
Temperature Rise (°C)			
Magnetizine symus analogad	*	Vag/Na	
Magnetizing curve enclosed	·	Yes/No	
Core No.	1 / 2	1 / 2	
Type of Protection	1 , 2	1 , 2	
(differential/Distance/REF etc.)	/	/	
Current Ratio at specified tap	/		
Accuracy Class	/		
Burden (VA)/Resistive Burden-R _b (ohms)	/		
Secondary Winding Resistance at 20°C,			
R _{ct} (ohms)	/	/	
Temperature Rise (°C)	*		



REFE!	RENCE			
SECT:	ION NO. DESCRIPTION	'A'	<u>'B'</u>	'C'
4.24	(continued)			
	For class TPS CTs per IEC			
	Rated symmetrical short circuit current			
	factor -K _{SSC}	*/*	/	
	Dimensioning parameter -K	*/*		
	Excitation limiting secondary voltage			
	$-U_{al} (Volts)^*$	*/*		
	Accuracy limiting secondary exciting			
	$current - I_{al} (mA)$	*/*		
	Secondary excitation current-I _{mag}			
	at half excitation limiting secondary			
	voltage (mA)	*/*		
	For class C or K CTs per IEEE / Class P CT	• <u>•</u>		
	per IEC			
	Magnetizing current -I _{mag} (mA)	*/*	/	
	Knee point voltage -V _k (Volts)/			
	/Secondary limiting e.m.f	*/*	/	
	Tertiary Bushing Current Transformer			
	Manufacturer	*		
	Type Designation	*		
	No. of CTs per phase			
	Continuous Thermal Current Rating Factor		· -	
	Continuous Thermal Carrent Rusing Luctor			
	Protection CT			
	Multi Ratio CTs (MRCT)			
	Single Ratio CTs		<u> </u>	
	5			
	Rated Short Time Withstand Current			
	Thermal I_{th} (kA)	*		
	Dynamic (kA_{peak})			
	Dynamic (kA _{peak})	$2.6 \mathrm{xI}_{\mathrm{th}}$		
	Short Time Thermal Current duration			
	(sec.)			
	(300.)			
	Rated primary short circuit current			
	I _{PSC} (kA)	*		
	*L2C (117.1)			
	Temperature Rise (°C)	*		
	remperature Rise (C)			



REFE	ERENCE			
<u>SECT</u>	<u>DESCRIPTION</u>	'A'	'B'	'C'
<u>NO.</u>	<u>DESCRIPTION</u>			
4.24	(continued)			
	Core No.	1 / 2		
	Type of Protection			
	(differential/ REF etc.)			
	Current Ratio at specified tap	/		
	Accuracy Class			
	Burden (VA)/Resistive Burden-R _b (ohms)			
	Secondary Winding Resistance at 20°C,			
	R _{ct} (ohms)	/		
	For class TPS CTs per IEC			
	Rated symmetrical short circuit current			
	factor -K _{SSC}	/		
	Dimensioning parameter -K			-
	Excitation limiting secondary voltage			
	-U _{al} (Volts)*	/		
	Accuracy limiting secondary exciting			
	current $-I_{al}$ (mA)	/		
	Secondary excitation current-I _{mag}			
	at half excitation limiting secondary			
	voltage (mA)	*/*		
	For class C or K CTs per IEEE / Class P C	<u>I</u>		
	per IEC	de Ch		
	Magnetizing current -I _{mag} (mA)	*/*		
	Knee point voltage -V _k (Volts)/	ታ /ታ		
	/Secondary limiting e.m.f	*/*		
	Bushing Current Transformers for W.T.I			
		*		
	Manufacturer	*		
	Type Designation			
	Ratio HV	*		
	HV LV	*		
		*		
	TV Purdon (VA)	*		
	Burden (VA)			
	Accuracy Class	*		



REFEI SECTI	RENCE ION DESCRIPTION	1.4.1	IDI	ICI
<u>NO.</u>	<u>DESCRIPTION</u>	'A'	'B'	'C'
1.24	Terminations			
	Termination for HV Winding			
	Open Bushings (oil/Air)	Yes/No		
	Type of conductor			
	Conductor material			
	Conductor size (mm²)			
	Cable Box			
	Type of cable			
	Cable size (mm²)			
	Material			
	Number of phase			
	Method of termination			
	(Pothead, stress cone, heat shrinkable)		_	
	Number of terminations			
	Terminal enclosure required	Yes/No		
	Type (Air, Oil)			
	Incoming cable take off method (Vertical, horizontal, Angle to horizontal)			
	GIS (Oil/ SF ₆)			
	(For details refer to 32-TMSS-02			
	Data Schedule and attach			
	relevant data)	Yes/No		
	Bus Duct			
	(If bus duct is required, full			
	details will follow order			
	Placement)	Yes/No		
	Termination for LV winding			
	Open Bushings (oil/Air)	Yes/No	<u> </u>	
	Type of conductor			
	Conductor material		-	
	Conductor size (mm²)		· · · · · · · · · · · · · · · · · · ·	

REFERENCE



7.0 DATA SCHEDULE

SECTION	<u>DESCRIPTION</u>	'A'	'B'	'C'
<u>NO.</u>	· · · · · · · · · · · · · · · · · · ·		- 	
4.24 (<u>con</u>	tinued) Cable Box			
	Type of cable			
	Cable size (mm ²)			-
	Material			
	Number of phase Method of termination			
	(Pothead, stress cone,			
	heat shrinkable)			
	Number of terminations			
	Terminal enclosure required	Yes/No		
	1			
	Type (Oil, Oil)	Yes/No		
	Incoming cable take off method			
	(Vertical, horizontal, Angle to			
	horizontal)			
	GIS (Oil/ SF ₆)			
	(For details refer to 32-TMSS-02			
	Data Schedule and attach relevant data)	Yes/No		
	Bus Duct			
	(If bus duct is required, full details will follow order Placement)	Yes/No		
	follow order i faccinent)	1 05/110		
	Termination for Tertiary Windings			
	Open Bushings	Yes/No		
	Type of conductor			
	Conductor material			
	Conductor size (mm²)			
	2.11. 2			
(Cable Box			
	Type of cable			
	Cable size (mm²)			
	Material			
	Number of phase			
	Method of termination (Pothead, stress cone, heat shrinkable)			
	(1 outcau, suless cone, ficat sin fixable)		_	



REFE	RENCE			
SECTI	<u>ON</u> <u>DESCRIPTION</u>	'A'	'B'	'C'
<u>NO.</u>	<u>DESCRIPTION</u>	A		
4.24 (<u>c</u>	ontinued)			
	Number of terminations			
	Terminal enclosure required	Yes/No		
	Type (Air, Oil)			
	Incoming cable take off method (Vertical, horizontal, Angle to horizontal)			
	GIS (Oil/ SF ₆)			
	(For details refer to 32-TMSS-02 Data Schedule and attach relevant data)	Yes/No		
	Bus Duct (If bus duct is required, full details will			
	follow order Placement)	Yes/No		
4.25	Surge Arresters Provision for Surge Arresters mounting required (If surge arresters are required Data Schedule of 35-TMSS-01 shall			
	be completed and attached by the			
	specifying engineer)	Yes/No		
	specifying engineer)	100/110		_
4.26	On line Gas Analyzer with mositure	Yes/No		
	Analyzer			
	AUXILIARY SUPPLIES			
	Voltage for Motors and Controls (V_{ac}/V_{dc})			
	Number of phases			
	Number of wires			
	DC Voltage for Control and Protection.(V _{dc})	125		

REFERENCE



7.0 DATA SCHEDULE

SECT NO.	<u>DESCRIPTION</u>	'A'	'B'	'C'
5.0	WEIGHT AND DIMENSIONS			
	Weight of Core and Coil Assembly (kg)	*		
	Weight of Core (kg)	*		
	Weight of Copper (kg)	*		
	Weight of Oil (kg)	*		
	Total Weight (kg)			
	with oil	*		
	without oil	*		
	Shipping Weight (kg)	*		
	Volume of Oil - Main Tank (liters)	*		
	Volume of Oil - Conservator (liters)	*		
	Overall Dimensions of the Assembled Transformer			
	Height (mm)	*		
	Width (mm)	*		
	Length (mm)	*		
	Maximum Shipping Dimension Transformer			
	Height (mm)	*		
	Width (mm)	*		
	Length (mm)	*		
	Shipping			
	Maximum permissible acceleration during shipment in, (g)			
	Lateral direction	*		
	Longitudinal direction	*		



REFERENCE				
SECTION NO.	<u>DESCRIPTION</u>	'A'	<u>'B'</u>	'C'
5.0 (continued)				
Verti	ical direction	*		
Maximum (Deflection	Guaranteed Permanent			
Unde	er Pressure test. (mm)	*		
Unde	er Vacuum test (mm)	*		
6.3 Special Te	sts			
Please list	special tests that shall be required_			
TRANSPO	RTATION LIMITATIONS			
overall dime	rify the maximum ensions of the transformer or oute or profile)	*		



A.	ADDITIONAL TECHNICAL IN NATIONAL GRID, SAUDI ARA		RES TO BE FURNISHED BY
B.	ADDITIONAL SUPPLEMEN' BIDDER/VENDOR/SUPPLIER/		ATURES PROPOSED BY
C.	OTHER PARTICULARS TO BE CONTRACTOR:	E FILLED UP BY BIDDER/	VENDOR/SUPPLIER/
	e of the Company tion and address	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
Name autho	e and Signature of orized sentative		
	ial Seal/Stamp e Company &		



UNINHIBITED INSULATING MINERAL OIL

Enquiry	No.			D	ate:	
Purchase or Contra	e Order No act No.			D	ate:	
PTS No.	/Project Ti	tle with J.O. No.				
REFERI SECTIO		DESCRIPTION	<u>'A'</u>	<u>'B'</u>	<u>'C'</u>	
3.0	APPLIO STAND	CABLE INDUSTRY. DARD	<u>IEC 60296</u>			
4.0		RMANCE REQUIREMENT HARACTERISTICS	S			
	Classifi	cation/Type of oil	*			
	Manufa	cturer's Designation of oil	*			

- 'A' NATIONAL GRID, SAUDI ARABIA SPECIFIED DATA/PARAMETER
- 'B' BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS
- 'C' REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'
- (*) DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/ SUPPLIER/VENDOR/CONTRACTOR IN COLUMN 'B'.



REFERENCE SECTION NO. DESCRIPTION	<u>'A'</u>	<u>'B'</u>	<u>'C'</u>
4 (Cont'd) Type of crude oil used	*		
Oil before Filling in Transfo	<u>ormer</u>		
Appearance/visual examinat	tion clear free from sediment & suspen- ded matter		
Color, Max.	*		
Kinetic Viscosity, Max. (mn	n ² /s) at :		
-30°C (ISO 3104)	1800		
+ 40 °C (ISO 3104)	12		
Flash point, Min. (°C) (ISO	2719) <u>135</u>		
Pour point, Max. (°C) (ISO	3016) <u>-40</u>		
Density, Max, (g/cm³)			
+ 20°C (ISO3675/ISO12185	<u>0.895</u>		
Interfacial tension at 25°C, Min. (dynes/cm) (EN14210/	4 <u>0</u> (ASTM D971)		



REFERENC	E			
SECTION N	O. <u>DESCRIPTION</u>	'A'	<u>'B'</u>	<u>'C'</u>
4 (Cont'd)	Dielectric Breakdown Voltage at 60Hz, Min. (kV) (IEC 60156)			
	• As delivered	<u>30</u>		
	Dielectric Dissipation Factor (Loss Tangent), at 60Hz, Max. at (IEC 60247/IEC 61620):			
	90 °C	0.005		
	Dentials Contact (IEC (0070)	No Coul Booms		
	Particle Content (IEC 60970)	No Genl. Reqmt		
	Acidity Max. (mg KOH/g)	<u>0.01</u>		
	(IEC 62021-1/IEC 62021-2)			
	Oxidation Stability : IEC 61125(C)			
	- Test Duration	<u>164H</u>		
	-Total Acid number, Max. (mg KC			
	(Cl. 1.9.4 of IEC 61125) -Sludge, Max (% by mass)	<u>1.2</u>		
	(Cl. 1.9.1 of IEC 61125)	0.8		
	- DDF at 90°C Max.	0.500		
	(Cl. 1.9.6 of IEC 61125 Amedtmt. 1 + IE			
	Water content at delivery, Max (p	pm)		
	(IEC 60814) - in Drums	<u>40</u>		
	in Dianis	<u>10</u>		
	- in Tank container	<u>30</u>		-
	Total Sulphur content, Max.	*		
	(IP 373/ISO14596)			
	Corrosive Sulphur			
	(DIN 51353)	Non Corrosive		



SECTION N		<u>'A'</u>	'B'	<u>'C'</u>
4 (Cont'd)	Inhibitors (IEC 60666) (U-Uninhibited) Presence of Anti oxidant	Not Detectable		
	Metal Passivator Additives (IEC 60666)	Not Detectable		
	Anti Oxidants (IEC 60666)	Not Detectable		
	Lowest cold start energizing Temperature (LCSET)	*		
	P. C. B Content (IEC 61619)	Not Detectable		
	P. C. A Content, Max. (%) 3.0 (IP 346)	*		
	2-Furfural and related compounds, Max. (mg/kg) <0.05 (IEC 61198)	Not Detectable		
	Stray Gassing (Cl. 6.22 of IEC 60296)	* -		
	Gassing Tendency, Max. (μL/min.) IEC 60628 (A)			
	H ₂	<u>+30</u>		
5.2	Corrosive Sulphur Per IEC 62535	Noncorrosive _		
5.3	DBDS (IEC 62697-1)	Not Detectable		



REFERE SECTION		'A'	<u>'B'</u>	'C'
5.6.1	Electrostatic charging tendency (if applicable)	*		
6.0	MODE OF DELIVERY			
	Drums or tank container capacity	*		
	Total number of drums or tank container	*		
	Weight of oil in each drum or tank container	*		



	UNINHI	BITED INSULATING MINERAL	LOIL
A.	ADDITIONAL TECHNICAL I NATIONAL GRID, SAUDI AF	NFORMATION OR FEATUR RABIA:	ES TO BE FURNISHED BY
B.	ADDITIONAL SUPPLEMEN	NTARY DATA OR FEA	TURES PROPOSED BY
	BIDDER/VENDOR/SUPPLIER	R/CONTRACTOR:	
C.	OTHER PARTICULARS TO E CONTRACTOR:	BE FILLED UP BY BIDDER/VI	ENDOR/SUPPLIER/
		Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
	e of the Company tion and address		
Name	e and Signature of		
	entative		
	cial Seal/Stamp e Company &		



	nal Grid Saudi a Enquiry No.		Date:	
Arabia	nal Grid Saudi a Purchase Order No ntract No.		Date:	
	nal Grid Saudi Arabia PTS roject Title with J.O. No.			
	RENCE ION NO. <u>DESCRIPTION</u>	'A'	'B'	'C'
3.0	APPLICABLE CODES AND STANDARDS	<u>S</u>		
	Applicable Industry Standard	*		
4.0	DESIGN AND CONSTRUCTION REQUIR	EMENTS		
	Model Designation	*		
4.1	No. of phases	3/1		
4.2	Performance Characteristics and Rating Regulation Range (% of Maximum Rated Power) for Variable Shunt Reactor Rated Power (Mvar) at Rated Voltage	Fixed/Variable		
	Cooling method Rated nominal system Voltage			
	(33kV or 34.5, 69, 110, 115, 132, 230, 380)			
	Maximum operating voltage (Um) kV Linearity (%)			
	Frequency (Hz)	60		

- A'- NATIONAL GRID SAUDI ARABIA SPECIFIED DATA/PARAMETER.
- 'B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.
- 'C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.
- (*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/ VENDOR/CONTRACTOR IN COLUMN 'B'.



DATA SCHEDULE 6.0

	ERENCE <u>TION NO.</u> <u>DESCRIPTION</u>	'A'	<u>'B'</u>	'C'
4.2	(Continued)			
	Rated short time current (kA)			
	Duration (sec)			
	, ,	Line Reactor/		
	Type	Bus Reactor		
	Noise level			
	ONAN rating (dB)	*		
	ONAF rating (dB) (if specified)	*		
	Vector group	YN		
	Reactance:			
	100% rated voltage (ohms)	*		
	110% rated voltage (ohms)	*		
	Maximum Tap Position (ohms)	*		
	Intermediate Tap Position (ohms)	*		
	Minimum Tap Position (ohms)	*		
	Zero sequence reactance (ohms)	*		
	Mutual reactance (ohms)	*		
	Harmonic current (%)			
	3 rd harmonic (%)	*		
	5 th harmonic (%)	*		
	(, 0)	·		
	Permissible unbalance current among			
	different phases (%)			
	•			
	Ratio of zero sequence reactance to			
	positive sequence reactance			
	Max. rated power at rated voltag (Mvar)	*		
	Min. rated power at rated voltag (Mvar)	*		
	Max. rated power at max. voltage (Mvar)	*		
	Min. rated power at max. voltage (Mvar)	*		
	Max. rated current (A) at rated voltage	*		
	Min. rated current (A) at rated voltage	*		
	Max. rated current (A) at max. voltage	*		
	Min. rated current (A) at max.voltage	*		



	ERENCE <u>FION NO.</u> <u>DESCRIPTION</u> (Continued)	'A'	<u>'B'</u>	'C'
	Temperature Rise Based on Ambient Conditions Specified in 01-TMSS-01			
	Winding (°C)	*		
	Oil (°C)	*		
	Winding maximum (Hot spot) temperature	*		
	Low Voltage Winding Rated Voltage(V) Rating (kVA)	Yes/No 400V _{ac}		
4.3	Construction			
4.3.1	Maximum Design Flux Density at Rated Voltage (Tesla)	*		
	Flux density at 110% rated voltage (Tesla)	*		
	Saturation Voltage (%U _N)	*		
	Knee Point in Magnetic flux versus Current curve (curve to be enclosed)	*	Yes/No	
4.3.2	Maximum Impulse Withstand Voltage Line Terminal (kV _{peak})	*		
	Neutral Terminal (kV _{peak})	*		
	Separate Source Power Frequency Withstand Voltage			
	Line Terminal (kV _{rms})	*		
	Neutral Terminal (kV _{rms})	*		
	Switching impulse withstand voltage			
	Line Terminal (kV _{peak})	*		
	Neutral External Connection	Solid Grounding/ Neutral Reactor		



REFEREN SECTION 4.3.2		'A'	<u>'B'</u>	<u>'C'</u>
	Winding Insulation	Uniform/ Non- uniform		
4.3.3/4.3.4	Type of tank construction			
	Tank Cover	Welded		
	Min. thickness of tank steel (mm)	*		
	Min. Thickness of radiator plates (mm)	*		
	Maximum Positive Withstand Pressure	*		
	of Tank and Radiators (kPa) Minimum Vacuum Withstand (kPa)	*		
	Willimium Vacuum Willistand (Ki a)			
4.3.6	Guaranteed Losses at 100% rated voltage	*		
	Losses at:			
Auxil Maxir	110% rated voltage (kW)	*		
	Auxiliary Losses Maximum Tap Position (kW) Intermediate Tap Position (kW) Minimum Tap Position (kW)	* 		
		*		
		*		
	<u></u>			
4.3.7	Buchholz Relay			
	Manufacturer	*		
	Type Designation Alarm/Trip Contact Current Rating at	*		
	125Vdc	*		
4.3.8	Pressure Relief Device for Main Tank			
1.5.0	Manufacturer	*		
	Type Designation	*		
	Number of Pressure Relief Device(s)	*		
	Pressure Range for Operation			
	(From to kPa)	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	2		
	Alarm Contact Current Rating at 125 Vdc (A)	*		
4.3.9	Maintenance free Breather	Yes/No		



DATA SCHEDULE 6.0

REFER SECTION	ENCE ON NO. DESCRIPTION	'A'	'B'	'C'
	<u> </u>			
4.3.10	Oil Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Type of Liquid Sensing Element	*		
	Provision of maximum indicator	Yes/No		
	Adjustment Range of Alarm and	0-160°C		
	Trip contacts (From_to_°C) Contact Current Rating at 125 V _{dc} (A)	*	<u> </u>	
	Number of contacts	4		
	ramoer or contacts	<u> </u>	<u> </u>	
4.3.11	Winding Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Provision of Maximum Indicator	Yes/No		
	Adjustment Range of Alarm and			
	Trip Contacts (From_to_°C)	0-160°C		
	Contact Current Rating at 125 V _{dc} (A)	*		
	Number of contacts	4		
		·		
4.3.12	Fiber Optic Sensors	Yes/No		
	Manufacturer	*		
	Type Designation	*		
	No. of Fiber Optic Sensors	*		
	•			
4.3.13	Oil Level Indicator			
	Manufacturer	*		
	Type Designation	*	<u></u> .	
	Alarm Contact Current Rating at 125 V _{dc}			
	(A)	*		
4.3.14	Off Load Tap Changer			
	Manufacturer	*		
	Number of steps			
	Step Voltage (%)			
	Tapping Range (%)			
	rapping range (70)			



DATA SCHEDULE 6.0

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
<u>~~~~~~</u>	<u>= = = = = = = = = = = = = = = = = = = </u>			
	l Tap Changer (OLTC)			
	ufacturer	*		
Coun	ntry of origin	*		
Type	<u> </u>	Vacuum		
Type	Designation	*		
Tap A	Arrangment			
*	ear, Reversing or Coarse/fine)	*		
Num	ber of steps			
Step	Voltage (%)			
Size	of reactive power each			
-	s (Mvar)	2.5		
Regu	llation Range (%)			
Rate	d Through Current (A)	*		
Shor	t Circuit Current (kA)	*		
Dyna	amic short circuit current			
(kAp	eak)	*		
Loca	tion (In-tank type fitted inside			
react	or main tank/outside reactor			
main	tank or External mounted type)	*		
Volta	age Class (kVrms)	*		
BIL	(kVpeak)	*		
Type	of transition impedance (high			
resist	tance)	*		
	e of transfer from one step to			
anoth				
	motor-operated (seconds)	*		
	manually operated (Number of			
1	revolution)	*		
0.11.0				
	ilter unit for OLTC	*		
	or drive unit:			
	Type	*		
	Power	*		
	Rated Voltage (Vac)/(Vdc)	*		
	Number of phases	*		
(Control voltage (Vac or Vdc)	*		
C	haatar (Maa)	*		
-	heater (Vac)	*		
H	eater Wattage (W)	*		



REFERE	ENCE			
SECTIO	N NO. DESCRIPTION	'A'	<u>'B'</u>	'C'
4215 ((Continue I)			
4.3.15 (<u>Continued)</u> Oil/Gas Surge Relay for OLTC	*		
	Manufacturer	*		
	Country of origin	*		
	Type Designation	*		
	Alarm/Trip Contact Current Rating at			
	$125 \text{ V}_{dc}(A)$	*		
	Pressure Relief Device (OLTC)			
	Manufacturer	*		
	Country of origin	*		
	Type Designation	*		
	Number of Pressure Relief Device(s)	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	*		
	Alarm/Trip Contact Current Rating at			
	$125 \mathrm{V_{dc}} (\mathrm{A})$	*		
1216	Ladder			
4.3.16	Laddel	Yes/No		
4.3.17	Drain Filter and Compling Valves			
4.3.17	Drain, Filter and Sampling Valves Type & Size of Oil Drain Valve (mm)			
	(attach drawing)	50		
	Type and Size of Filtration			
	Valves (mm) (attach drawing)	50		
	Size of Oil Sampling Valve/s (mm)			
	(attach drawing)	20		
	Type & Size of Radiator Valves (mm) (attach drawing)	*		
	(attach drawing)	<u> </u>		
4.3.19	Moving Facilities			
	р			
	Reactor Base Type	Skid/Wheels		
	Wheel Details			
	Whools Contor to Contor Distance			
	Wheels Center to Center Distance (1100/2100/3100mm)	*		



REFERENCE SECTION NO. DESCRIPTION	'A'	<u>'B'</u>	'C'
4.3.23 Bushings			
High Voltage Bushings:			
Manufacturer	*		
Type designation	*		
Material	*		
Location (top, side, others)			
Terminal take off angle (vertical,			
horizontal, angle)			
Number			
Rated Voltage (kV)			
Rated Maximum Voltage (kV)			
Rated current (A)	*		
BIL (kVpeak)	*	· -	
Switching Impulse Withstand Voltage,	•		
if applicable (kVpeak)	*		
Power Frequency Dry/Wet Withstand			
Voltage (kVrms)	*		
Creepage distance (mm)	*		
Cantilever strength (kN)	*		
Mounting details			
Hole circle diameter of the			
flange (mm)	*		
Number of bolts	*		
Hole diameter (mm)	*		
Terminal	*		
Type	* *		
Size	*		
No. of holes, if applicable	~ 	· ———	
Neutral Bushings:			
Manufacturer	*		
Type designation	*		
Material	*	· -	
Location (top, side, others)		· -	
Terminal take-off angle (vertical,		· -	
horizontal, angle)			
Rated Voltage (kV)	*		
<u> </u>			



REFERENCE			
SECTION NO. DESCRIPTION	'A'	<u>'B'</u>	'C'
4.3.23 (<u>Continued</u>)			
Rated Current (A)	*		
BIL (kVpeak)	*		
Power Frequency Dry/Wet Withstand			
Voltage (kVrms)	*		
Creepage distance (mm)	*		
Cantilever strength (kN)	*		
Mounting details			
Hole circle diameter of the flange (mm)	*		
Number of bolts	*		
Hole diameter (mm)	*		
m · 1			
Terminal	*		
Type Size	*		
No. of holes (if applicable)	*		· · · · · · · · · · · · · · · · · · ·
4.3.24 Bushing Current Transformers for W.T.I.			
Manufacturer	*		
Type Designation	*		
Ratio	*		
Accuracy Class	*		
No deal Dealine Comment Transference			
Neutral Bushing Current Transformer	*		
Manufacturer	*		
Type Designation			
No. of CTs per Phase			
Continuous Thermal Current Rating Factor			
- Multi Ratio CTs (MRCT)			
- Single Ratio CTs			
Rated Short Time Withstand Current			
- Thermal I _{th} (kA)	*		
- Rated Dynamic current	$2.6 \mathrm{xI_{th}}$		
Short Time Thermal Current duration	2.0/1[[]		
(sec.)	*		
Rated primary short circuit current			
I _{PSC} (kA)	*		



REFER	RENCE			
	ON NO. DESCRIPTION	'A'	<u>'B'</u>	'C'
4.3.24	(Continued)	ate.		
	Temperature Rise (°C)	*		
	Core No.			
	Type of Protection (differential etc.)			
	Current Ratio at specified tap			
	Accuracy Class			
	Burden (VA)/Resistive Burden-R _b (ohms)	*		
	Secondary Winding Resistance at			
	20°C, R _{ct} (ohms)	*		
	For class TPS CTs per IEC			
	Rated symmetrical short circuit	*		
	current factor -K _{SSC}	*		
	Dimensioning parameter -K Excitation limiting secondary voltage			
	-U _{al} (Volts)	*		
	Accuracy limiting secondary			
	exciting current – I _{al} (mA)	*		
	Secondary excitation current-I _{mag}			
	at half excitation limiting secondary	ate		
	voltage (mA)	*		
	For class C or K CTs per IEEE / Class P			
	CTs per IEC			
	Magnetizing current -I _{mag} (mA)	*		
	Knee point voltage -V _k (Volts)/	*		
	Secondary limiting e.m.f			
4.3.27	Auxiliary Supplies			
4.3.27	DC Voltage for Control and Protection.			
	(V_{dc})	125		
	(· de)			
4.3.28	Terminations			
	Termination for HV Winding:	Yes/No		
	Open Bushings (oil/Air)			
	Type of conductor			
	Conductor material	_		
	Conductor size (mm²)			
	Conductor bize (min)			



REFER				
SECTIO		'A'	<u>'B'</u>	<u>'C'</u>
4.3.28	(<u>Continued)</u>			
	Cable Box:	Yes/No		
	Type of cable			
	Cable size (mm²)			
	Material			
	Number of phase			
	Method of termination (Pothead, stress			
	cone, heat shrinkable)			
	Number of terminations			
	Terminal enclosure required	Yes/No		
	Type (Air, Oil)			
	Incoming cable take off method			
	(Vertical, horizontal, Angle to			
	horizontal)	_		
	GIS (Oil/SF6):	Yes/No		
	(For details refer to 32-TMSS-02 Data			
	Schedule and attach relevant data)	_		
	Bus Duct:	Yes/No		
	(If bus duct is required, full details will	1 65/110		
	follow order Placement)			
	Tollow order Tracement)			
	Pressure Relief Device for Oil Cable Box			
	Manufacturer _	*		
	Type Designation	*		
	Number of Pressure Relief Device(s)	*		
	Pressure Range for Operation			
	(From to kPa)	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	2		
	Alarm Contact Current Rating at 125			
	Vdc (A)	*		
4.3.29	Surge Arresters	Yes/No		
	Provision for Surge Arresters Mounting			
	Required (If surge arresters are required			
	Data Schedule of 35-TMSS-01 shall be			
	completed and attached by specifying			
	engineer)			



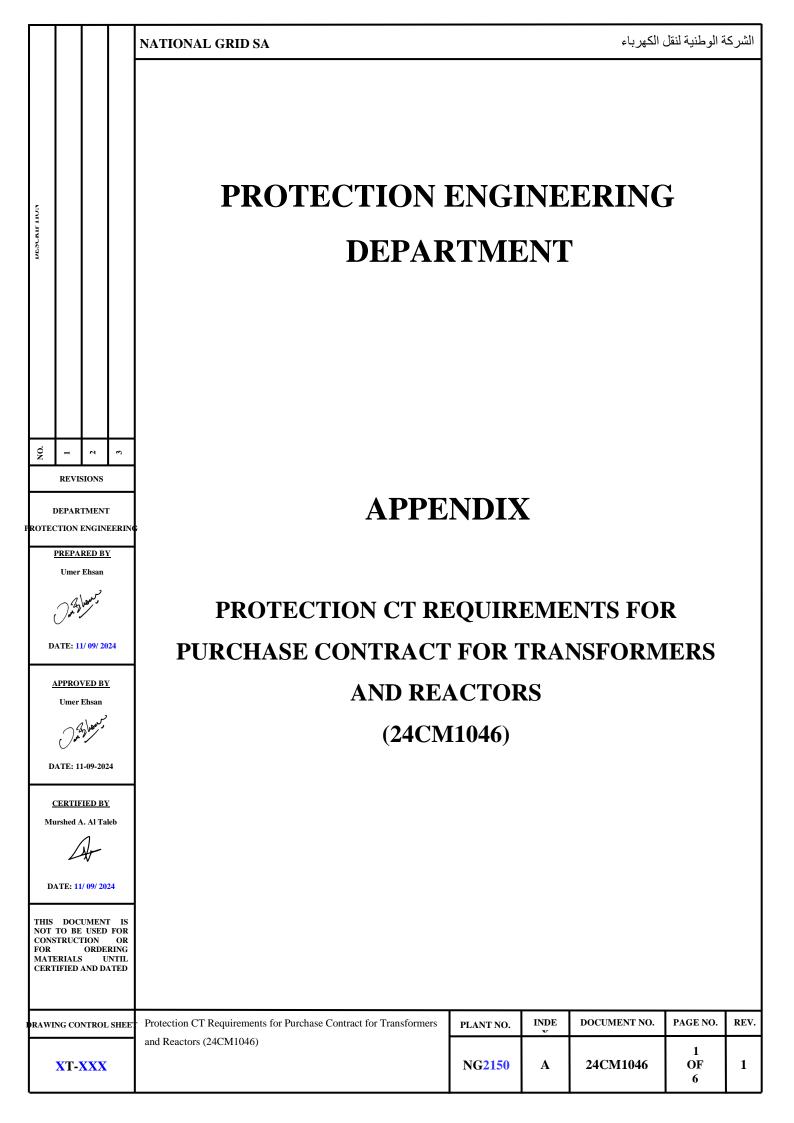
DATA SCHEDULE 6.0

	RENCE ON NO. DESCRIPTION	'A'	'B'	'C'
4.3.30	Reactor Oil (Manufacturer shall fill up column 'B' of 54-TMSS-01 data schedule)			
4.3.31	Online Gas Analyzer with mositure Analyze	Yes/No		_
	ADDITIONAL INFORMATION			
	Approximate Shipping Dimension			_
5.5	Special Tests Please list special tests that shall be required			



A.	ADDITIONAL TECHNICAL IN NATIONAL GRID SAUDI ARA		RES TO BE FURNISHED BY
B.	ADDITIONAL SUPPLEMEN BIDDER/VENDOR/SUPPLIER/		ATURES PROPOSED BY
C.	OTHER PARTICULARS TO CONTRACTOR:	BE FILLED UP BY B	SIDDER/VENDOR/SUPPLIER/
	e of the Company ion and address	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
autho	sentative		
	ial Seal/Stamp Company &		

PROTECTION REQUIREMENTS



				NATIONAL GRID SA			الكهرباء	ة الوطنية لنقل	الشركة
				Contents					
NOT JINOS				 A. 110/13.8 KV YNyn0+d1, X/R= (as per 67 MVA solidly grounded from HV side 132/13.8 KV YNyn0+d1, X/R= (as per 67 MVA solidly grounded from HV side 132/13.8 KV Dyn1, X/R= as per PTS, MVA 115/13.8 KV Dyn1, X/R= as per PTS, MVA B. 132/33 KV YNyn0+d1, X/R= as per PT 	PTS), %age Wage impe	ge impe edance	edance as per (as per PTS) (as per PTS)	PTS 50 50-67 50-67	-
<u>_</u>			_	100 MVA solidly grounded from HV sig	_	преча	nce – as per i	10 00-	
NO.	REVI	SIONS	e	C. 40MVAR, 132kV Bus Shunt Reactor					
	DEPAR		Г						
PROTE	CTION	ENGIN	EERIN						
		RED B	<u>Y</u>						
	~ A	ومساح							
	OATE: 1	2 \www.							
	APPRO Umer	· Ehsan	<u>Y</u>						
		وسيعال	•						
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M	urshed A	A. AI Ta	ıleb						
ı	ATE: 11	√√ 1/ 09/ 20)24						
	DOC								
NOT CON FOR MAT	TO BE	E USED TION ORDE S U	FOR OR ERING JNTIL						
DRAW	ING CO	ONTROI	L SHEE	Protection CT Requirements for Purchase Contract for Transformers	PLANT NO.	INDE	DOCUMENT NO.	PAGE NO.	REV.
	XT-	XXX		and Reactors (24CM1046)	NG2150	A	24CM1046	2 OF 6	1
_					•			•	

				NATIONA	L GRID SA						ç	الكهربا	ة الوطنية لنقل	الشركة
				A. <u>′</u>	110/13.8 KV	YNyn0-	-d1, X/R=	(as pe	er PTS)	, %age	impedaı	nce a	s per PT	<u>ΓS</u>
				<u>;</u>	50-67 MVA s	solidly g	rounded	from I	HV side	<u> </u>				
				<u>-</u>	132/13.8 KV	YNyn0-	-d1, X/R=	(as pe	r PTS)	, %age	impedaı	nce a	s per PT	Γ <u>S</u>
				<u> </u>	50-67 MVA s	solidly g	rounded	from I	IV side	<u> </u>				
,				-	132/13.8 KV	Dyn1, X	(/R= as p	er PTS	, %age	impe	dance (as	per	PTS) 50-	_
VESCRIF LIUN				<u>(</u>	67 MVA									
DESCE				<u>.</u>	115/13.8 KV	Dyn1, X	(/R= as p	er PTS	, %age	impe	dance (as	per	PTS) 50-	_
				<u>(</u>	67 MVA									
				1- <u>′</u>	132 KV or 11	15kV or 1	110kV Hig	jh Volta	age Bus	shings	<u>Side</u>			
				CT#	Ratio	Class	Vk [V]	Rct	lm	ag	Burden	Ann	lication	
				01#	[A/A]	Olass	VK[V]	[Ω]	[m	A]	[VA]	7,66	iloation	
				CT-1	600/1	PX	≥ 720	≤ 2	≤ 2	_	_	Spa	are for	
					300/1		≥ 360	≤ 1	≤ :				7 T-1	
NO.	-	7	3	CT-2	600/1	PX	≥ 720	≤ 2	≤ 2		-		are for	
	REV	ISIONS	Н		300/1		≥ 360	≤ 1	≤ :	50		8	7 T-2	
	DEPAR	RTMEN	г		2000/1									
PROTE		ENGIN		OT 0	1600/1	- DV	≥ 1400	≤ 2	30	mA		•	are for	
	PREPA	ARED B	<u>Y</u>	CT-3	1200/1	PX	@ 800A	@	@ 8	00A	-		_ine tection	
		r Ehsan			1000/1		600A	800A				Pio	tection	
		2 harry		CT-4	49WT – F	or Windin	 a Temper	ature as	ner NG	stand:	ard			
		11/ 09/ 20		01 4	45771 1	OI VVIIIGII		ature ac	perite	Jana				
H				2 122	K\/ or 110k\	/ Lliah \/	oltogo No	utrol D	uchina	Sida (i	f annliach	lo)		
		VED B	<u>Y</u>	<u> </u>	KV or 110kV Ratio	<u>підп v</u>	Titage ive	ullal D		nag	Burden	<u>ie)</u>		
	ير م			CT#	[A/A]	Class	Vk [V]	Rct [9	21	nA]	[VA]	Арр	lication	
	نعول				600/1		≥ 720	≤ 2		25	[77 1]			
L I	DATE: 1	11-09-20	24	NCT-1	300/1	PX	≥ 360	_ <u></u> ≤ 1		50	-	R	EF-1	
	<u>CERTI</u>	FIED B	<u>Y</u>		600/1		≥ 720	≤ 2		25				
М	lurshed	A. Al Ta	ıleb	NCT-2	300/1	PX	≥ 360	≤ 1	<u> </u>	50	-	R	EF-2	
	1	A.		3- 13 8	KV Medium	Voltage	Rushings	Side						
	OATE: 1	1/ 09/ 20)24	5 10.0	Ratio	- snago	_ aormige	<u> </u>	Ir	nag	Burden			
THIS	S DOG	CUMEN	T IS	CT#	[A/A]	Class	Vk [V]	Rct [0	2]	nA]	[VA]	App	lication	
	STRUC		FOR OR CRING	CT-5			As per N	⊥ G stand		-		1	AVR	
	TERIAL TIFIED	S U AND D	JNTIL ATED	CT-6			As per N	G stand	ard				19W	
PRAW	ING CO	ONTROI	L SHEET		Requirements for F	Purchase Cont	ract for Transfo	rmers	PLANT NO.	INDE	DOCUMEN	T NO.	PAGE NO.	REV.
	XT-	XXX		and Reactors	(24CM1046)				NG2150	A	24CM1	046	3 OF 6	1
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					4- 13.8	KV MV Neu	tral Bush	nings							
					CT#	Ratio [A/A]	Class	S Vk [V]	Rct [Ω]		nag nA]	Burden [VA]	Ар	plication	
					NCT-3	3600/1	PX	≥ 800	≤ 16	≤ 2	25	-	F	REF-1	
					NCT-4	3600/1	PX	≥ 800	≤ 16	≤ 2	25	-	F	REF-2	
					NCT-5	1500-800/1	5P20	-	-		-	30	S	BEF-1	_
					NCT-6	1500-800/1	5P20	-	-		-	30	S	BEF-2	
. NO.	-	6	3												
DEPOTECTION PRE	EPAR Umer F	ENGINERED BY	Y Y	NG	<u>fı</u>	32/33 KV Y rom HV sid (V High Volt	<u>e</u>			<u>'S, 80-</u>	<u>100 M</u>	VA solid	ly gr	<u>ounded</u>	
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				NCT-1	600/1	PX		720 360	≤ 2 ≤ 1	≤ 2 ≤ 3		-	RE	F-1	
DESCRIF LIUN				NCT-2	600/1	PX		720 360	≤ 2 ≤ 1	≤ ; ≤ ;		-	RE	F-2	
DE				<u>3- 13.8 l</u>	√ <u>KV Medium</u>	Voltag	ge Bu	shings	Side			l			
				CT#	Ratio [A/A]	Class	s VI	k [V]	Rct [Ω]	lm [m		Burden [VA]	Appli	cation	
				CT-5		1	As	per NG	standard	l			Α'	۷R	
				CT-6			As	per NG	standard				49	W W	
				4- 33 K\	/ MV Neutra	al Busl	nings					l			
NO.	1	2	3	CT#	Ratio [A/A	1 6	lass	Vk [V]	Rct		lmag	Burden	Δη	olication	
	REVI	SIONS		01#	Nalio [A/A	,,	iass	VK[V]	[Ω]		[mA]	[VA]	App	Jilcation	
I	DEPAR'	TMEN'	Г	NCT-3	2000/1	Р	Χ	≥ 600	≤ 6	≤	50	-	F	REF-1	
ROTE	CTION	ENGIN	EERING	NCT-4	2000/1	Р	Χ	≥ 600	≤ 6	≤	50	-	F	REF-2	
]	PREPA		<u>Y</u>	NCT-5	3000-1500/	′1 5	P20	-	-		-	30	S	BEF-1	
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TRAINING REQUIREMENTS

OPERATIONAL SPARE PARTS REQUIREMENTS

SPECIAL TOOLS & EQUIPMENT REQUIREMENTS

DEPARTMENT PCDD

PREPARED BY Project Engineers

Babar Khan (Project Engineers)

DATE: 14/07/2024

APPROVED BY Group Leaders

Babar Khan (Group Leaders)

DATE: 14/07/2024

CERTIFIED BY
NOVEL CONTRACT
PROCUREMENT
DIVISION MANAGER



Sultan Ibrahim Al-Rayes (Division Manager) DATE: 14/07/2024

THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED



APPENDIX

FOR

SPECIAL TOOLS & EQUIPMENT

NOVEL CONTRACT PROCUREMENT DIVISION PROJECTS CONTRACT DEVELOPMENT DEPARTMENT ENGINEERING & ASSET MANAGEMENT NATIONAL GRID SAUDI ARABIA

DRAWING CONTROL SHEET	SPECI	AL TOOLS & EQUIPMENT	PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.
XT-XXXXXX	xxxxxx	SAUDI ARABIA	NGXXX	A	Appendix	1 OF 2	0

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DEPARTMENT PCDD

PREPARED BY Project Engineers

Babar Khan (Project Engineers)

DATE: 14/07/2024

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Sultan Ibrahim Al-Rayes (Division Manager) DATE: 14/07/2024

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A. Power transformer and Bus Reactor:

Tools for 50/67MVA, 80/100MVA,400MVA ,115/13.8kV,110/13.8 kV,132/13.8kV ,132/33kV ,230/115/34.5 kV, Transformer & 230 kV 80 MVAR,132kV 40MVAR bus reactor.

- 1. One (1) set Lifting jacks (4nos) each, Jigs or special bolts, etc for lifting core and winding for TRANSFORMERS AND BUS REACTOR.
- 2. One (1) set Open wrenches, size 6", 8" & 10"
- 3. One (1) set Adjustable wrenches, size 6", 8" & 10"
- 4. One (1) set Socket wrenche.
- 5. One (1) set Torque wrench.
- 6. One (1) set C -Clamp.
- 7. One (1) set Manila rope 18dia, 10m.
- 8. One (1) set Wire rope 6x37, 38dia, 15m

----- End -----

DRAWING CONTROL SHEET	SPECIA	L TOOLS & EQUIPMENT	PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.
XT-XXXXXX	xxxxxx	SAUDI ARABIA	NGXXX	A	Appendix	2 OF 2	0